Mechanisms, markets, and monitors: A theory of endogenous choice of governance mechanisms in market equilibrium

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Abstract

We model a world where managerial opportunism can be countered by several governance mechanisms: activist investors, the threat of asset redeployment, incentive compensation, or formal board monitoring. Firms choose combinations of these mechanisms to develop their governance structures, and their choices affect the equilibrium premium earned by activist capital. At the individual firm level, opacity of the firm, the level of managerial diversion costs, and the premia required to compensate activist investors are among the factors that drive the choice of governance structure. These factors can have opposite effects on governance choices at the individual firm and aggregate levels, e.g., a reduction in the opacity of a single firm increases the likelihood of that firm adopting strong board governance, while a reduction in opacity throughout the economy can decrease aggregate adoption of strong board governance.

JEL Classification Codes: G20, G34;
Keywords: governance, asset liquidity, institutional design

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Introduction

Firms’ governance structures consist of a combination of governance mechanisms such as managerial compensation, a board of directors, and share ownership structure. Most research on corporate governance, however, has tended to focus on the efficacy of individual governance mechanisms, ignoring their interactions with other mechanisms within a governance structure. For example, most research on board effectiveness has focused on board monitoring as the only mechanism able to check opportunism and has taken a partial equilibrium perspective—assuming that costs of monitoring are fixed and independent of the level of demand for monitoring.\(^1\) Similarly, research on CEO compensation design has tended to ignore the role of monitoring and other governance mechanisms in controlling managerial opportunism.\(^2\) Evidence that individual mechanisms are not necessary components of a governance structure suggests that this approach to understanding governance is deficient. For example, firms have thrived without either incentive compensation or monitoring by external directors. Indeed, insider boards and fixed salary compensation were quite common in widely-held U.S. corporations throughout the nineteenth and early twentieth centuries [Bainbridge (1995)]. Therefore, a comprehensive explanation of governance which explains the facts should encompass a broad menu of control mechanisms. At the same time, the explanation should account for the first-order reality that firms endogenously select among mechanisms, that the value of any one mechanism depends on the other mechanisms deployed, and consider the aggregate demand for resources used by the control mechanisms. The aim of this paper is to provide such a comprehensive theory.

We develop a model in which firms optimize across several governance mechanisms including a vigilant board, incentive compensation, activist ownership, and the threat of ownership changes. Our model is based on the following premises: (a) the manager-firm relation is long-lived and the value of this long-term relationship exerts a first-order effect on managerial behavior, (b) corporate assets have some, albeit diminished, value if redeployed outside the firm, (c) activist investors are capable of monitoring management, and (d) activist capital can be in short supply and thus command rents. In our analysis, individual firms are price takers in securities markets, and face fixed costs of activist and non-activist capital. Based on these costs, individual firms optimize governance to maximize shareholder value. Three of the four governance structures that emerge as candidate optimal structures—imminent redeployment, intervention, and imminent intervention—rely on shareholder control without active board monitoring. The fourth relies on shareholders handing over oversight responsibilities to a board with a contractual

\(^1\)See, for example, Raheja (2005).
\(^2\)See, for example, Dittmann and Maug (2007).
obligation to monitor.

The imminent redeployment structure relies on supernormal CEO compensation coupled with the threat of asset redeployment, which deprives the manager of control over the firm’s assets. It may involve replacing the manager or asset liquidation—either piecemeal, as with mutual fund withdrawals, or complete, as in the liquidation of manufacturing assets. In our model, redeployment is achieved by shareholder vote. However, an ownership stake held by a large creditor who is granted liquidation rights would accomplish the same end. The threat of redeployment can be effective even when ownership is held by unsophisticated outside investors. All that is required is that managerial compensation provides a premium over the manager’s labor market value. This premium reflects the divertability of the firm’s assets, i.e., the ease with which the manager can appropriate assets. Under an imminent redeployment governance structure, we expect a passive board, little shareholder activism, and super-normal CEO compensation. Increasing redeployability and the strength of internal controls such as accounting systems, increases the attractiveness of this structure.

The next two structures, intervention and imminent intervention, rely on share ownership by activist investors who have skills required to oversee management. Because of limited supply, activist capital may command excess returns. The intervention governance structure relies on direct intervention by activist investors to restrain managerial opportunism. In this case, compensation is modest and is tied to the manager’s skill set rather than the divertability of the firm’s assets. However, firm value reflects the deadweight costs associated with regular intervention by activist investors to check management. Lowering opacity makes this governance structure more attractive.

The imminent intervention governance structure relies instead on the threat of activist intervention and enables the firm to avoid incurring these deadweight costs. However, to deter managerial opportunism, the threat of activist investor intervention has to be complemented by supernormal CEO compensation and a sufficiently large activist

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3Strong legal and internal accounting systems, by making it difficult for managers to disguise opportunism, raise the cost of diversion to managers. Loss of reputation might also lower the net benefit from diversion as do any ethical qualms managers might have regarding opportunistic action. For example, Franks, Mayer, and Rossi (2008) document that, in 19th century England, the reputation costs of opportunism high enough to deter opportunism even in the absence of extensive formal control mechanisms or disclosure.

4This postulate, that activist intervention can affect firm performance and activists earn rents from such interventions, while by no means established, is supported by research such as Schor and Greenwood (2009) and Becht, Franks, Mayer, and Rossi (2008). Thus, developing testable predictions of this postulate is of some value to empirical research.

5Strong external (financial) accounting systems and regulatory reporting requirements lower opacity. Complexity of the firm’s cash flow generating technology will tend to work in the opposite direction, increasing opacity.
blockholding. Thus, under control by imminent intervention, as in the case of imminent redeployment, we expect a passive board, little shareholder activism, and high CEO compensation. However, in contrast to redeployment, imminent intervention requires a sophisticated ownership base. Another difference between the two structures is that, unlike imminent redeployment, under imminent intervention, the manager retains control of the assets but is disciplined by the threat of lower compensation and more activist interference.\textsuperscript{6} Increasing opacity and lowering redeployability makes this structure more attractive.

While the informal control mechanisms discussed thus far can limit or even completely block managerial opportunism, they either entail supernormal compensation or require attracting scarce informed activist capital. An alternative is to commit to consistent intervention. Strong board governance is necessary for such commitment. This governance design calls for a more formalized structure under which a board supervises managerial behavior on a regular basis. As in the case of the intervention governance structure, managerial compensation is modest and is tied to the manager’s skill set rather than the divertability of the firm’s asset base. Thus, this sort of governance corresponds to the “good” or democratic governance enforced by a strong, vigilant, and independent board that is favored by reformers. However, even with “angelic” board members, who always act in shareholder interests and require no compensation to induce monitoring, active board governance is attractive only when firm opacity is low. Therefore, lowering opacity increases the attractiveness of board governance.

Thus far we have considered how changes in the characteristics of a single firm affect the attractiveness of the governance structures. However, these characteristics can also undergo an economy-wide shift and also can vary across economies. Empirical studies of the effect of such shifts have gained increasing prominence in the corporate finance literature.\textsuperscript{7} We show that when activist capital is in short supply, the comparative statics for aggregate shifts frequently are the reverse of those for shifts at an individual firm level. While a reduction in opacity for a single firm will increase the propensity of that firm to use board governance, an economy wide increase in opacity will decrease the fraction of firms relying on board governance. This sort of reversal in comparative statics is also observed with respect to changes in the level of the divertability of firm assets. Thus, the supply of activist capital has profound implications for cross-sectional predictions regarding the effect of economywide changes in governance variables. A testable consequence

\textsuperscript{6}See Gao, Harford, and Li (2010) for evidence on lowered compensation to CEOs following poor firm performance.

\textsuperscript{7}See, for example, Cao, Qian, and Wang (2009).
of this result is that in a world where activist capital is not scarce and activists earn normal returns, a reduction in opacity would encourage fewer firms to opt for activist monitoring and thus encourage board monitoring and lower management compensation. When activist capital is scarce, improved standards would lower the required size of activist holding, and lead more firms to control opportunism with the now cheaper activist capital. This change will also result in an increase in supernormal compensation and reduction in the monitoring role of boards.

Because our work embraces a broad array of governance choices, it relates to a wide spectrum of theoretical research. In pursuing this goal of breadth we have, of necessity, slighted depth, and analyzed particular features of the manager-firm relationship in more stylized fashion than they were first expounded in the literature. Like Harris and Raviv (2008), the threat of depriving a manager of control over a firm’s assets can check managerial opportunism. In their analysis, managers, by buying shares, can influence the likelihood of an asset sale via a takeover. In our analysis, however, managers only influence asset sales through the performance they engender. As in our analysis, Kahn and Winton (1998) permit activist shareholders to intervene. They permit activists to trade on secondary markets and assume an exogenous ownership structure. We do not allow secondary market trading but do allow for multiple activists, and focus on optimal ownership structures. When we consider investor activism, we also abstract from its effect on the manager’s choice of investment policy as modelled by Burkart, Gromb, and Panunzi (1997). Instead, we assume that the manager’s only choice is whether to operate a fixed investment in the interest of shareholders. We also consider, like Dow and Raposo (2005), the role of the level of compensation in aligning managerial and shareholder interests. They allow managers to choose investment policy; we assume a fixed investment frontier. Gillette, Rebello, and Noe (2003) model the effect of board composition and voting procedures on performance. We abstract from voting strategy and assume a specific relation between board structure and performance—greater outsider representation enhances board effectiveness. Finally, as in Gomes and Novaes (2001), we argue that competition among opportunistic insiders can be beneficial to outside shareholders.

The rest of the paper is organized as follows. In Section 1., we describe the basic structure of our model. In Section 2., we present a detailed analysis of equilibria in the basic model, where we consider and compare monitoring by investors, and by a board of directors. Section 3. examines the effect of economy-wide changes on the comparative statics of the model. In Section 4., we discuss changes to the inferences from the basic model due to opportunism by activist investors and insider directors on the board. In Section 5. we elaborate on empirical predictions from our analysis, and its implications for
empirical studies of corporate governance. Section 6. concludes the paper. The appendix contains formal proofs of all results in the paper not contained in the text.

1. Model

Consider a world populated by infinite-lived risk-neutral agents who prefer current to future consumption. The set of dates is the set of non-negative integers. All agents have additive utility over periods and have a constant rate of time preference given by $\beta$. A risk-free asset trades in each period. Our assumption on time preferences ensures that the rate of return on this asset is $r = \frac{1-\beta}{\beta}$. At date 0, investors choose between investing in the risk-free asset and firms. There is no subsequent asset trade.\(^8\)

There is a continuum of firms, each making a negligible contribution to aggregate output. To formalize this idea, we posit a set of firms represented by $\Omega$ and a non-atomic measure defined over (measurable) subsets of $\Omega$, $\nu$. We identify these firms with their initial date 0 owners. Each firm has access to a project that requires an initial date 0 investment of $1. Funds for the initial investment are raised at date 0 by selling shares to a finite number of large activist investors. Activist investors are identical and each has total investible funds of $\bar{P}$. Shares not sold to activists are retained by the original owners who have sufficient funds to supply all investment capital required in excess of the proceeds from sales to activists. At the cost of a bit more notation, we could assume that the initial owners are penniless and sell the residual fraction of the firm to passive investors who have sufficient wealth to fund all the projects. However, to simplify exposition, we have chosen not to do so.

While raising capital at date 0, each firm, $\omega$, decides on an ownership structure. The structure specifies the fraction of firm value claimed by each block sold to an activist, $\zeta(\omega)$ and a desired number of activist blocks, $N_A(\omega)$. Each firm also sets a price per activist block, $P(\omega)$. Each activist can buy only one block for a given firm.\(^9\) Facing this

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\(^8\)As will become clearer later, these assumptions permit us to transparently solve for the market equilibrium premium for activist capital. Extending the analysis by permitting the secondary market for shares to operate at after date 0 is quite easy but not very useful. Because our agents are rational and risk neutral, there is neither noise trading nor hedging demand for securities. Thus, the standard preconditions for gains from trade for either activists or the initial owners are not satisfied. A more interesting but much more difficult extension of the analysis would be to permit the primary market to remain open at later dates. This would require new firms equipped with profitable investment opportunities to arise at later dates. Consequently there could be a positive premium for activist capital at subsequent dates and this premium could fluctuate with the rate of entry of new firms. While this may allow for the analysis of the dynamics of the premium and hence corporate governance, such dynamics would not materially affect our conclusions. In fact, in earlier versions of this paper we demonstrate that the same tradeoffs drive optimal governance structures in the presence of a time-invariant premium for activist capital.

\(^9\)This assumption ensures that all activists investing in a given firm hold equal stakes in that firm. Ex ante all activists are identical so there is no particular reason to discriminate between activists.
Demand schedule, activists choose the set of firms in which to buy blocks. The activists' funding constraints imply that, for each activist, the integral of prices over the set of blocks purchased must be no greater than the total funds available to the activist. An equilibrium is a set of ownership structures with the property that firms cannot offer terms to any activist which, if accepted, increase the payoff to that activist as well as the firms. Further technical details on aggregation and equilibrium are provided in the appendix together with an explanation of the technical reasons for which we choose our approach.

Each firm needs a manager and capital to remain operable. A firm is operable in each period in which it maintains a capital endowment of $1. This capital allows it to generate a risky cash flow, $\tilde{x}$, at the end of the period. Cash flows are independent across firms and across time. Each firm's cash flow depends on an observable but unverifiable state of the world that is revealed at the end of the period. The cash flow, $\tilde{x}$, equals $h$ when the state of the world is $H$ and equals $l < h$ when the state of the world is $L$. States $H$ and $L$ occur with probability $\rho$ and $1 - \rho$, respectively. If a firm does not maintain capital of $1$, and is hence inoperable, it generates a cash flow of 0 in the current period and remains inoperable in all future periods. Thus, in any period in which a firm maintains its capital base, it is common knowledge that it will generate a minimum cash flow of $l$. This cash flow is verifiable. However, the cash flow in excess of $l$ is unverifiable because, even though the realized state is observable by both parties, it is not verifiable.

1.1. The agency problem

At the beginning of every period, the manager can decide whether to divert part of his firm’s end-of-period cash flow for personal consumption.\textsuperscript{10} If he decides to divert the cash flow, he incurs a cost of $f$. We conceptualize this cost primarily as a cost incurred by the manager to defeat internal audit controls. However, other costs are consistent with our framework, e.g., the manager’s ethical qualms regarding opportunistic behavior. From our perspective, as well as being costly, diversion requires time-consuming preparation. This preparation involves, for example, the development of a parallel accounting system.

\textsuperscript{10}\textsuperscript{We do not distinguish between the various forms of managerial diversion: blatant looting as observed in the case of Enron and Adelphia, and more subtle forms of diversion. For example, at the level of abstraction of this model, a CEO lowering the Net Present Value (NPV) of corporate investments by establishing a more expensive headquarters close to family rather than the most cost-effective location “diverts” the extra cost of the headquarters from the firm. Thus, our results are not dependent on the ability of the CEO to engage in criminal activity. Nor do they require all forms of diversion to be unverifiable by the legal system; only some diversion opportunities should not be verifiable.}
to disguise diversion, identifying corrupt suppliers or customers for deceptive invoicing, setting up special purpose legal entities, and identifying and disguising real investment projects that sacrifice shareholder gains for private benefits. Because of the necessity of such preparation, we assume that the diversion decision is made at the start of a period, even though diversion itself occurs at the end of the period. Consequently, we assume that the diversion cost incurred by the manager is paid at the beginning of a period, the point in time when he decides to divert. The manager can only succeed in diverting cash if the cash flow $h$ is realized. If he is successful in diverting, the manager appropriates the unverifiable portion of the cash flow, $h - l$, leaving investors with $l$.

The manager’s compensation contract can be used to discourage diversion. Because states are unverifiable, the contract cannot be made contingent on the state realization, ruling out the possibility of forcing contracts that pay the manager nothing if he diverts. In order to induce the manager to disgorge the unverifiable cash flow, the contract contains a cash-flow-contingent payment: the manager is paid $w$ if he reveals that the cash flow is $h$ and is paid 0 if he reveals that the cash flow is $l$. Note that, based on the manager’s incentive structure, this compensation scheme is an optimal compensation design because it minimizes the manager’s incentive to divert cash flow. One can think of this payment scheme, following the interpretation of Harris and Raviv (1995), as a payment contingent on reporting the state as being $H$.

As well as restraining managerial opportunism through compensation, an owner can control opportunism with three other mechanisms: a strong independent board, activist ownership, and redeployment, i.e., transferring control of the firm’s asset’s away from the manager. The key differences between these mechanisms are timing and commitment. Because of these differences, each mechanism captures a different style of governance.

Both activist owners and a strong board can monitor and intervene in the firm. Intervention, whether by the board or activists, preempts the manager’s scheme to divert. To ensure that their intervention is successful, both activists and the board have to monitor the firm. Intervention without monitoring destroys the firm’s assets and renders the firm inoperable in the current and future periods. Monitoring, like the manager’s scheme to opportunistically divert cash flow, requires preparation. Moreover, to detect imminent diversion monitoring must occur during the time period in which the manager’s diversion scheme is launched. Thus, we assume that monitoring occurs at the beginning of a period.

\footnote{It is reasonable to restrict manager to either stealing nothing or diverting the unverifiable portion of cash flows, $h - l$, because a manager, being an employee of the firm, has no rights to dispose of corporate assets beyond those over which he is granted control by his contract with the firm. No legal system we are aware of limits the board’s rights to recover assets verifiably diverted by any employee, including the CEO.}
Examples of monitoring include assessing the robustness of audit and accounting systems, investigating the benefits to shareholders from proposed projects, developing systems for evaluating the fair market value of corporate transactions with outside entities. Since intervention will only occur after monitoring, hereafter, we use the terms intervention and monitoring interchangeably.

Activists do not commit to intervention and their monitoring is not observed by the manager at the time the manager makes his diversion decision at the beginning of each period. Thus, activists and managers move simultaneously in a manner similar to Cournot competition. This sort of monitoring follows the treatment used by Fudenberg and Tirole (1990) in a more abstract principal-agent setting. There are several justifications for adopting this information structure. For example, while we do not structure our model to accommodate secondary-market trading, in reality, activists have trade-based incentives to disguise their activism; because activists spend their own money on monitoring, their expenditures cannot be easily tracked by the manager. Activists could, of course, announce their intention to monitor, but such announcements are not credible because, if they were believed, there would be no incentive to invest resources in actually monitoring.

In contrast, managers have many means of becoming aware of board vigilance before they decide to act opportunistically. For example, board members interact with and solicit information from the manager; board monitoring is paid for by the firm; boards frequently control managers by imposing tight audit requirements and structures. Therefore, we assume that a board’s attempt to monitor is known by the manager. It follows that the board acts as a Stackelberg leader, with the the manager acting as a follower, conditioning his actions on the board’s commitment to monitor. Moreover, the board acts to maximize shareholder wealth and commits to monitoring.\textsuperscript{12}

Redeployment differs from both board and activist intervention in that it occurs after the cash flow and state have been observed. Therefore, redeployment occurs at a point in time at which shareholders know whether the manager acted opportunistically. In this case, shareholders condition on the manager’s actions and thus the manager acts a Stakelberg leader. Unlike monitoring, either by activists or the board, redeployment cannot preempt opportunism. Thus, its only role is as an \textit{ex post} threat.

To intervene, an activist has to maintain a shareholding of at least $\zeta > 0$. Intervention by any one activist is sufficient to block managerial diversion. Each activist makes her intervention decision independently at the beginning of each period. If an activist chooses

\textsuperscript{12}Strauz (1997) demonstrates how constituting a board enables shareholders to achieve outcomes that they cannot attain on their own. Later, we examine the effects of loosening the assumption of board commitment to monitoring and examine the effects of divergence in the objectives of board members and conflicts of interest between the board and shareholders.
to monitor, she incurs a cost of $c < l$ and $c < \rho(h - l)$. An activist incurs no cost if she chooses not to monitor. The cost of monitoring depends on how difficult it is for outsiders to ascertain managerial diversion. Thus, the ease of such assessment will be inversely proportional to the opacity of a firm’s assets and operations. Opacity itself will depend on the firm’s operating scope, the nature of its technology, external reporting requirements, and media and analyst scrutiny.

It is not obvious whether the cost of board monitoring is more or less than the cost of activist intervention. On one hand, board monitoring costs might be higher because activists could develop expertise through monitoring multiple firms. On the other hand, boards have superior rights to internal information. This may lower their cost of monitoring relative to outside activists. Because we have no strong a priori reason to believe that board monitoring costs are greater or less than outside activists’ monitoring costs, we do not want to derive comparisons that depend on these cost differences. Hence, we simplify matters by assuming that the cost of board monitoring, $b$, equals the cost of monitoring by a single activist:

**Assumption 1.** $b = c$.

Investors, both original owners and activists, have control rights over a firm’s assets. Thus, investors can force the redeployment of the firm’s assets. At the end of each period, investors jointly decide whether to remain invested in a firm. If they choose to stay invested, with the exception of the $\$1$, all cash flows net of managerial diversion and compensation are paid out as a dividend. The firm then enters the following period with capital of $\$1$, ensuring that it remains operable. Alternatively, investors can decide to redeploy the firm’s assets, a decision on which all shareholders must agree. Following redeployment, investors receive the net cash flow earned in that period, and claims on the redeployed assets. The value of claims on the redeployed assets equals the $\$1$ of capital invested in the firm less a redeployment cost, $\lambda \in [0, 1]$. This cost, $\lambda$, may be interpreted as an index of asset liquidity or the cost involved in replacing the manager. These replacement costs are likely to vary with the depth of the pool of replacement managers and the need for a replacement manager to develop extensive firm-specific skills. The size of the pool of potential acquirers for a firm’s assets will also affect the redeployment cost. If assets are redeployed, the manager has to seek alternative employment. Following the manager’s separation from the firm, he is able to command a per-period wage of $\bar{v}$, his per-period reservation wage.

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13As stated earlier, we are considering asset redeployment in its broadest sense, i.e., the ability to remove managerial control over the firm’s assets either via replacement, piecemeal asset sales, or in toto asset sales.
Let $V$ represent the present value of cash inflows to a firm if investors choose to operate it continuously after their initial investment. It follows that:

\[
V = \left[ \frac{\rho h + (1 - \rho) l}{r} \right].
\]  

(1)

To focus on interesting regions of the parameter space, we make the following assumptions:

**Assumption 2.** $V - \frac{\bar{v}}{r} > 1$.

**Assumption 3.** $f < r V - l$.

**Assumption 4.** $l + f < r$.

Assumption 2 ensures that, in the absence of opportunism by the manager, investing in a firm is a positive Net Present Value (NPV) transaction and thus investors have an incentive to contribute capital to the firm. Assumption 3 ensures that the manager’s diversion cost is sufficiently low to make diversion attractive to him. Assumption 4 implies that investing in a firm is a negative NPV endeavor if investors capitalize the firm and subsequently permit the manager to divert cash flows in every period, even if they are able to recover from the manager an amount equal to his periodic cost of diversion $f$.

### 2. Optimal governance structures for the individual firm

Each firm picks its governance structure, acting as a price taker with respect to the cost of activist capital. The firm’s ownership structure is put in place at the beginning of the first period and remains unchanged over time. Several governance structures are feasible within our framework. First, we derive firm value under each of these governance structures. Then, from among these governance structures, we identify the optimal governance structure for each individual firm as a function of the governance environment and firm characteristics.

#### 2.0.1. Board control

Because board monitoring is observable by the manager, he will condition his diversion decision on the board’s activities. When the board commits to monitoring, observing the board’s commitment to monitoring, the manager will refrain from diverting. Because the manager knows he cannot divert, he need only be paid his reservation wage. As the manager does not divert, shareholders do not bear the wealth transfer associated with diversion. Moreover, there is no need to include activists in the ownership structure.
Proposition 1. Board control results in a firm value of

\[ V - \frac{\bar{v}}{r} - \frac{c}{r}. \]  \hspace{1cm} (2)

It is clear that board governance will prevent managerial diversion. However, there is one disadvantage of board control. It results in certain intervention, resulting in a periodic deadweight cost equal to \( c \). To see this, note that the maximum firm value in the absence of activist ownership, board monitoring, and managerial diversion is given by

\[ V - \frac{\bar{v}}{r}. \] \hspace{1cm} (3)

Thus, the difference between (3) and (2) captures the discount relative to the “first best” firm value. This cost associated with certain intervention may be excessive when compared to the deadweight costs generated by informal governance structures that we describe below.

2.1. Informal governance structures with activist ownership

One set of informal governance structures involves activist ownership coupled with a weak board that does not monitor the manager. Firms that prefer a governance structure requiring activist ownership have to convince activists to contribute capital at date 0. Successful activists have unique skills or have developed an infrastructure to effectively identify and capitalize on situations that are ripe for intervention. Such specialized skills and infrastructure ensure that “skilled” activist capital is relatively scarce. Because activist capital is scarce and activist intervention may be valuable, it may be necessary to offer activists ownership stakes at prices lower than the value the original owners would place on these stakes. As we demonstrate in the following lemma, this price discount is equivalent to offering activists a return on their investment of \( r_A \geq r \).\footnote{In practice, a higher rate of return to activist investors can be generated in a number of ways. Krishnamurthy, Spindt, Subramaniam, and Woidtke (2005) document higher returns to strategic investors generated by explicit price discounts in private placements. Franks, Mayer, and Rossi (2008) document how relationship investors earn abnormal returns by disguising their holding information at the time they acquire an initial stake in a troubled firm. Many models of strategic investors assume or demonstrate how these investors endogenously generate abnormal returns (see, for example, Noe (2002) or Michelacci and Suarez (2004)).} Thus, in the first period, activists ownership stakes are valued by discounting expected cash flows at the rate \( r_A \). Activist capital does not command a premium in subsequent periods because firms’ ownership structures are fixed at date 0 and because of the stationary nature of firms’ operations, there are no opportunities for activists to profitably redeploy their
capital in subsequent periods.

**Lemma 1.** In any equilibrium, there exists a rate of return at which the activists’ cash flow shares are discounted, $r_A \geq r$, such that optimal ownership structures maximize the sum of the present discounted values of the activists’ and initial owners’ claims on each firm’s cash flows.

While activist ownership is valuable, it can come at a cost. This cost, by influencing the value of a firm with activist ownership, has important implications for governance choices.

### 2.1.1. Governance via activism

The first governance structure featuring activist ownership relies on periodic *intervention* by activists. Under this governance structure, both the manager and activists adopt stationary strategies, i.e., they play the same strategies every period. Activists intervene with positive probability along the equilibrium path, and the manager diverts cash flows with positive probability in every period. Moreover, the probabilities with which activists intervene and the manager diverts are stationary, i.e., invariant over time.

No stationary equilibria exist where the firm is financed and the probability of activist intervention is zero because, if activists do not intervene, it is optimal for the manager to divert cash flows with certainty. However, Assumption 4 ensures that, if the manager diverts with certainty, investing in the firm is a negative NPV transaction for investors. Consequently, they will not capitalize the firm. Stationary equilibria also cannot feature certain intervention by activists because the manager’s best response to certain intervention is to avoid diversion. However, certain intervention by activists is not a best response to this lack of diversion by the manager. Thus, as stated in the following proposition, the only stationary equilibrium outcomes are ones where the manager and activists both randomize. Therefore, in intervention equilibria, the manager diverts with positive probability along the equilibrium path.

**Proposition 2.** In any intervention equilibrium, both the manager and the activists play stationary random strategies. The manager’s periodic wage equals $\frac{\delta}{\rho}$, and firm value is given by

$$
\left( \frac{\zeta N_A}{r_A} + \frac{1 - \zeta N_A}{r} \right) (r \mathcal{V} - \bar{v}) - \frac{c N_A}{r_A} - \frac{c (1 - \zeta N_A)}{\zeta r} \left( \frac{f}{r \mathcal{V} - l - \bar{v}} \right) \frac{1}{r_A}. \tag{4}
$$
In each period, each activist intervenes with probability

\[ \pi^* = 1 - \left( \frac{f}{rV - l - \bar{v}} \right)^{\frac{1}{N_A}}, \]  

and the manager diverts cash flows with probability

\[ \theta^* = \frac{c}{\zeta f} \left( \frac{f}{rV - l - \bar{v}} \right)^{\frac{1}{N_A}}. \]

Randomization by activists and the manager fixes the cost of managerial opportunism and thus firm value in intervention equilibria. The difference between (4) and (3), the maximum firm value in the absence of activist ownership and managerial diversion, captures the costs of opportunism. These costs are borne both by activists and the original owner. To ensure randomization, activists receive the same payoff from monitoring as they do when not monitoring. Thus, the loss to each activist from managerial diversion equals the cost of activism, c. The total loss to all activists is captured by the second term of (4) and is a function of firm opacity. In this sense, asset opacity is a key driver of firm value in intervention equilibria. The original owner’s payoffs depend on his ownership stake and the probability that the manager attempts diversion while no activists monitor. These effects are reflected in the last term of (4).

Because each activist acts independently of the others, even though only one activist has to intervene to block diversion, there may be instances where unnecessary deadweight costs are incurred because multiple activists choose to intervene simultaneously. Thus, firm value is maximized when only one activist is included in the firm’s ownership structure. When \( r_A > r \), there is an incentive to lower the sole activist’s ownership stake. The activist’s optimal stake is determined by balancing this incentive against the fact that a larger activist ownership stake, by encouraging monitoring, minimizes the losses incurred by the original owner due to managerial stealing.

An increase in the manager’s diversion cost decreases the manager’s gain from diversion, and consequently reduces the equilibrium monitoring intensity (\( \pi \)) required to make the manager indifferent between diverting and not diverting. Note however that, fixing the activist’s ownership stake, the increase in the cost of diversion does not affect the probability of attempting diversion (\( \theta \)), and thus the likelihood of successful diversion increases with the cost of diversion. Given the increased likelihood of successful diversion, the marginal gain from countering diversion with increased activist ownership increases, leading the firm to increase the activist’s ownership stake. Therefore, as stated in the following proposition, the equilibrium ownership stake of activists is a non-decreasing
function of the manager’s diversion cost, $f$.

**Proposition 3.** In any stationary intervention equilibrium, firm value is maximized by incorporating only one activist in the ownership structure ($N_A^* = 1$); when $r_A - r$ is sufficiently large, the optimal fraction of the firm held this activist is always less than 1. This optimal ownership stake is non-decreasing in the manager’s cost of diversion $f$.

The above results demonstrate that a firm’s ownership structure is sensitive to its opacity, the premium demanded by activists, and the manager’s propensity to divert cash flows.

### 2.1.2. Governance via threatened intervention

We now demonstrate that, in non-stationary equilibria, managerial diversion can be eliminated even without the activist intervention featured in intervention equilibria. Moreover, diversion is deterred without a strong and independent board. As is typically the case with multi-period models, there exist many non-stationary equilibria where agents’ strategies vary with the history of actions of the other agents. Our goal is not to exhaustively characterize all equilibria, but to identify the equilibria that maximize value to investors. To deter the manager from diverting, his future employment gains from avoiding diversion must equal at least his single period gain from diverting cash flows plus his future reservation payoff. Any equilibrium in which this lower bound for managerial compensation is attained maximizes the firm’s cash flows across equilibria where diversion does not occur. Hence, we focus on and characterize equilibria featuring this outcome.

One equilibrium that attains this bound on managerial compensation requires that investors pay the manager an “efficiency wage,” i.e., a premium relative to his reservation wage, so long as he does not divert. Subsequent to his first diversion, the manager’s compensation is cut, and both the manager and investors revert to stationary strategies like those they play in intervention equilibria—the manager randomly diverts and activists randomly intervene. The threat of lower compensation and activist intervention deters managerial diversion, and thus the manager does not divert along the equilibrium path. In this equilibrium, managerial compensation is sensitive to both the realization of the state in each period and to the manager’s actions. Moreover, because the manager is paid a premium in each period and his compensation is paid entirely when state $H$ is realized, his compensation displays greater variation with state realization than under board governance. This equilibrium is supported by the belief that, once the manager has diverted, he will continue to divert in every future period. Since these equilibria rely on the threat of potential intervention by activist shareholders, we call them *imminent*
intervention equilibria, and describe them in the following proposition:

Proposition 4. If the following conditions are satisfied:

\[ 1 - \lambda \leq \frac{l}{r}, \tag{7} \]

and \[ B \leq \min \left[ \frac{c}{r \zeta}, \mathcal{V} - \frac{\bar{v}}{r} - \frac{r_A}{r} \right], \tag{8} \]

where \[ B = \frac{r\mathcal{V} - l - f - \bar{v}}{r + \rho}, \tag{9} \]

there exist non-stationary, imminent intervention equilibria where a firm’s value is given by

\[ \left[ \frac{\zeta}{r_A} + \frac{1 - \zeta}{r} \right] \left[ r \left( \mathcal{V} - B \right) - \bar{v} \right]. \tag{10} \]

In such equilibria, the inclusion of one activist investor in its ownership structure maximizes firm value, and when \( r_A > r \), firm value is always strictly higher with one activist investor. An optimal holding for the activist is given by

\[ \zeta^* = \max \left[ \zeta, \frac{c}{r \mathcal{V} - l - \bar{v}} \right], \tag{11} \]

and this holding is strictly optimal if \( r_A > r \). The activist does not intervene so long as the manager has not diverted cash flows. In all periods subsequent to the one in which the manager diverts for the first time, the activist and manager adopt stationary strategies which call for the activist to intervene randomly and the manager to divert randomly. In these equilibria, the present value of the manager’s compensation is equal to \( B + \frac{\bar{v}}{r} \).

For randomized intervention by the activist to be a credible off-equilibrium path threat, this strategy has to maximize firm value given the activist’s beliefs regarding the manager’s future actions. As stated in (7), this threat of intervention is credible only when the firm’s value contingent on asset redeployment is sufficiently low. Moreover, the efficiency premium paid to the manager has to be small enough to satisfy (8), ensuring that activists are both willing to invest in the firm, and prefer paying the efficiency wage to lowering managerial compensation and triggering the randomized monitoring subgame.

In these imminent intervention equilibria, firm value is once again lower than its first best value. The shortfall is a function of the manager’s efficiency wage, which is reflected in \( B \), and the higher cost of activist ownership, which is captured by the the first term in brackets in (10). Thus, non-stationary equilibria, while they might eliminate the need for intervention on the equilibrium path, are not costless. From (9), it is clear that the
manager’s efficiency wage, and thus the cost incurred in imminent intervention equilibria, is decreasing in the manager’s cost of diversion and increasing the the required activist stake.

2.2. Governance without a board or activists

We now consider imminent redeployment equilibria in which neither a strong board nor costly activist ownership is necessary. In these equilibria, following the first incidence of diversion by the manager, the original owner redeployes the firm’s assets. The threat of redeployment will deter the manager only if his current period gain from diversion is no larger than the expected loss of future income because of redeployment. Given that the manager earns his periodic reservation wage of \( \bar{v} \) once he is separated from the firm, the manager’s income stream following diversion is identical to that following diversion in imminent intervention equilibria. Consequently, the threat of redeployment coupled with an efficiency wage that ensures that the present value of the premium he is paid relative to his reservation wage is given by \( B \), defined in (9) should be sufficient to deter diversion. Therefore, once again, managerial compensation is sensitive to both the realization of the state in each period and to the manager’s actions, and his compensation displays greater variation with state realizations than under board governance. Moreover, as in imminent intervention equilibria, the manager does not divert along the equilibrium path.

Redeploying firm assets is rational so long as the original owner believes that once the manager acts opportunistically, he will do so in every future period. Further, as described in the following proposition, the cost of redeployment has to be relatively small:

Proposition 5. If

\[
1 - \lambda \geq \frac{l}{r},
\]

and \( B \leq V - \frac{\bar{v}}{r} - 1, \)

there exist non-stationary imminent redeployment equilibria where firm value is given by

\[
\frac{1}{r} \left[ r \left( V - B \right) - \bar{v} \right].
\]

The original owner retains all the firm’s shares and the manager does not divert cash flows. If the manager diverts, the owner redeploys the firm’s assets. The present value of the manager’s compensation is equal to \( B + \frac{\bar{v}}{r} \).

For imminent redeployment equilibria to be viable, investing in the firm has to be
profitable even after accounting for the extra cost of the manager’s efficiency wage. This is assured by condition (13). The credibility of the threat of redeployment is assured by condition (12). For the same reasons as outlined in Proposition 4, this result implies that compensation will be less related to managerial characteristics when the cost of diversion is high.

These imminent redeployment equilibria are different from imminent intervention equilibria because of the operative off-equilibrium path threat that investors are able to employ to prevent the manager from diverting; in imminent intervention equilibria managerial diversion triggers intervention by activists who retain a minimum ownership stake in the firm; in imminent redeployment equilibria managerial diversion precipitates asset redeployment and the consequent termination of the manager’s control over the firm’s assets. Because activist ownership is not necessary to precipitate redeployment, firm value is maximized by an ownership structure without activist investors. Consequently, firm value falls below its first best only because of the manager’s efficiency wage.

2.3. A firm’s optimal control structure

Each governance structure described above limits managerial opportunism. Board governance completely eliminates opportunism. While activist ownership alone is not sufficient to deter managerial opportunism, when coupled with supernormal managerial compensation it too can completely eliminate opportunism. Neither a strong board nor activist ownership is necessary to successfully eliminate opportunism so long as the manager receives supernormal compensation and shareholders can credibly threaten to redeploy assets and separate the manager from the firm’s assets at the first instance of opportunistic behavior.

The optimal governance structure for a firm is the one that efficiently controls managerial opportunism. In our setting, this is equivalent picking the feasible governance structure with the lowest total deadweight cost. The feasibility of governance via imminent intervention and imminent redeployment varies with asset redeployability. The deadweight costs generated by a governance structure are the sum of the costs involved in controlling the manager, both monitoring costs and the excess managerial compensation, and the deadweight costs resulting from successful diversion by the manager. A strong board results in a periodic monitoring cost. Activist ownership is expensive and may either be associated with a positive probability of managerial diversion or have to be coupled with excess above-market compensation for the manager. Control via the threat of redeployment requires above-market managerial compensation. These deadweight costs vary with firm opacity and the manager’s cost of diversion. Consequently, the identity of
the optimal governance structure varies with the redeployability and opacity of a firm’s assets, and the manager’s diversion cost. Moreover, as the following result demonstrates, board control may be sub-optimal for firms.

**Proposition 6.** Firm value under board control is always higher than firm value under activist intervention.

*Firm value under imminent intervention, which is only feasible when the redeployment cost \( \lambda \) is relatively high, is higher than under board control when the manager’s efficiency wage \( (B + \bar{v}_r) \) and the return premium \( (r_A - r) \) required by activists are relatively low.*

*Firm value under imminent redeployment, which is only feasible when the redeployment cost \( \lambda \) is relatively low, is higher than firm value board control when the manager’s efficiency wage \( (B + \bar{v}_r) \) is relatively low.*

The principal finding from Proposition 6 is that, even when a shareholder-value-maximizing board that can be constituted to overcome a drawback in direct shareholder control—the inability to precommit to intervene—board control may not be optimal. More specifically, board control will be dominated by direct shareholder control when a firm’s operations are relatively opaque or when, because of a good governance environment, the manager’s diversion cost is relatively high. Increased opacity discourages the adoption of board control because it raises the deadweight loss from adopting board control while leaving the cost of shareholders’ control, implemented through imminent redeployment and imminent intervention, unchanged. The size of the premium in the manager’s efficiency wage \( (B) \) in the imminent intervention and imminent redeployment equilibria depends on the governance environment through the diversion cost \( (f) \). Higher values of \( f \) lower \( B \), and thus, favor imminent intervention and imminent redeployment equilibria. As these equilibria feature compensation in excess of the manager’s labor market value, the above result demonstrates how a better governance environment and greater firm opacity are more likely to result in managerial compensation that is excessive relative to the manager’s value on the labor market.

3. **The effect of economywide changes**

The preceding analysis demonstrates how individual firms, acting as price takers with respect to the cost of activist capital, will choose their governance structures. It also shows how a firm’s governance choice will change as its governance parameters—the managerial cost of diversion, firm opacity, and asset redeployability—change, holding all other firms fixed. We now illustrate how changes in governance parameters across an entire economy affect the prevalence of the governance mechanisms analyzed above.
Economy-wide shifts in governance parameters affect both the relative attractiveness of governance structures. This, in turn, affects the demand for activist capital. If activist capital is in short supply, i.e. demand at the risk-free rate exceeds supply, then the shift in demand for activist capital will result in an adjustment in the excess return earned by activists. This adjustment, by changing the cost of governance structures that rely on activist ownership, can change some of the comparative static results derived earlier for firm-level changes. In fact, an aggregate shift in a governance parameter can have the opposite effect to a change in the same parameter at the individual firm level.

Figure 1 illustrates how an economy-wide change in a parameter alters the premium commanded by activist capital. Panel A of this figure illustrates optimal governance structures when individual firms act as price takers with respect to the the premium commanded by activists \((r_A - r)\). Each graph in this panel illustrates how optimal governance structures vary with both the premium for activist capital and firm profitability indexed by \(\rho\), the probability of cash flow \(h\). The redeployment cost \(\lambda = 0.95\). Given the other parameter values, this is high enough to ensure that redeployment is not feasible. Thus, from Proposition 6 it follows that firms pick either board governance or governance via imminent intervention. With the exception of \(\rho\) all the remaining model parameters are assumed to be the same for all firms in the economy. The two graphs differ only in terms of the assumed value for the monitoring cost, \(c\), which is set at 0.070 for the first graph as opposed to 0.095 for the second graph. A comparison of these two graphs illustrates how higher values of \(c\) diminish the attractiveness of board governance for individual firms for fixed values of the premium for activist capital. This reduction in the attractiveness of board governance, at the individual firm level, is to be expected; monitoring costs are not paid on the equilibrium path with imminent intervention but are paid with board governance. Thus, an individual firm will be less likely to employ board governance when its costs of monitoring increase.

Now consider an economy-wide shift in the costs of monitoring. In Panel B we plot the supply curve for activist capital and two demand curves for activist capital, the lower demand curve corresponds to \(c = 0.070\) and the upper solid line to \(c = 0.095\). The lower demand curve is derived from the information contained in the first graph in Panel A, while the upper demand curve is derived from the information contained in the second graph. Each point on a demand curve represents the aggregate demand for activist capital for a given value of \(r_A - r\). This aggregate demand for activist capital is computed by summing the values of activist stakes across the cross section of firms for the given value of \(r_A - r\) in the corresponding Panel A graph. Cross-sectional variation in firm profitability arises from variation in \(\rho\), where \(\rho \sim \text{Uniform}[0.5, 1]\). An increase in the cost of monitoring
increases the demand for activist capital through two channels, first as discussed above, at a fixed premium, more firms prefer imminent intervention which requires activist capital. Second, at the higher level of cost, activist stakes must be larger to credibly threaten intervention. Thus, the upward shift in demand caused by increasing $c$ is fairly large, increasing the premium earned by activist capital from 0.0182 to 0.1027. This increase in the activism premium is, in fact, so large that, at the equilibrium premium, the fraction of firms relying on activist intervention is smaller as a result of the increase in the costs of monitoring. A qualitatively similar result obtains when we raise $f$, the manager’s diversion cost.

Figure 2 illustrates how changes in the underlying economy can affect the economywide prevalence of governance structures. Each curve plots a critical value of firm profitability, $\bar{\rho}$, as a function of the common economywide monitoring cost $c$. Board governance is optimal for firms whose profitability ($\rho$) exceeds $\bar{\rho}$ while firms with lower profitability find the imminent intervention structure optimal. The two upward sloping curves are drawn under the assumption that the premium commanded by activist capital is fixed: for the steeper curve $r_A - r = 0.0048$ and for the flatter one $r_A - r = 0.024$. Thus, these two curves illustrate the direct effect of changes in the monitoring cost on governance structure choices when the activists command a fixed premium. The kinked curve plots $\bar{\rho}$ when the premium paid to activists is endogeneously determined as a function of changes in the monitoring cost. It demonstrates how changes in the underlying economy that make governance structures that rely on activist ownership more attractive to individual firms may actually result in a smaller set of firm adopting such governance structures. The key insight here is that changes making activist ownership more attractive raise the premium commanded by activist investors. This increased premium is especially costly to highly profitable firms, causing them to switch to governance structures that do not rely on activist ownership.

[Figures 1 and 2 about here]

4. Opportunistic monitors

Thus far we have focused on identifying optimal governance structures when monitors, both board members and activists, are intent on deterring managerial opportunism and do not exploit opportunities to divert firm resources for their own benefit. However, monitors may compete with managers to divert resources. We now briefly discuss how monitor opportunism can alter a firm’s optimal governance structure.

First consider opportunistic board members. In the context of our model, board

\footnote{Varying the cost of managerial diversion yields qualitative similar insights.}
opportunism can take one of two forms; at the beginning of a period, the board can divert the resources provided to it to enable it to monitor the manager; at the end of the period, the board could divert the realized cash flow. A firm’s owner has two obvious alternatives to control board opportunist; he can ensure that there are sufficient “honest” outside board members to limit insiders’ ability to act opportunistically; he can incentivize board members through a combination of incentive compensation and the threat of dismissal.

Both alternatives will likely increase the deadweight costs generated by board control. It has long been recognized that, compared to outsiders on boards, inside board members have lower costs of monitoring and thus intervening in firm activities. At the same time, insiders have more opportunities to act opportunistically. Thus, to limit board opportunism, the owners will have to include more “costly” but honest outsiders on the board. Incentive compensation similar to the managerial contracts described above will result in owners expending $c plus the value of the compensation premium paid to the board to ensure it monitors the manager. In each case, the increased deadweight costs of board control are borne by firm owners and lower firm value by the entire amount of the additional deadweight cost.

Now consider opportunism by activists. As noted by Bainbridge (2002) and Barber (2006), activism is not always innocuous. Activists can impose real costs on a firm by influencing it in the direction of undertaking policies that further their interests. The ability of activists to act opportunistically depends on the specifics of the legal regime.

In the context of our model, we can view opportunistic activism as a form of diversion.

\[16\] As in the case of managerial diversion, board diversion does not necessarily require that members transfer firm cash flows to themselves. Getting the firm to invest in projects that benefit them or to sign contracts with entities they have a monetary interest in are examples of the sorts of diversion activities that board members can undertake.

\[17\] A number of authors have identified other sources of insider/outsider differences based on information, succession, bargaining power, etc. See, for example, Hermelin and Weisbach (1998), Gillette, Rebello, and Noe (2003), and Raheja (2005).

\[18\] For example, pension funds which face zero marginal tax rates on distributions have an incentive to demand that firms disgorge cash flows to investors even when such payments may not be in the interests of the marginal investor. Activists may also disrupt firm operations by over-monitoring in an attempt to develop a reputation for monitoring/activism. Examples of other costs imposed by activists include legal fees that firms incur to combat challenges by activists and the forced disclosure of proprietary information that may erode a firm’s competitive advantage. A sovereign wealth fund with a major stake in a firm can coerce the firm to increase its investment in its domestic industries. Another possibility is a activist hedge fund that takes a stake in a firm may also takes a long position in the firms options, and work to increase the firm’s earnings volatility, see, e.g., http://www.businessspectator.com.au/bs.nsf/Article/Hedge-funds-flex-muscles-BU3T3?OpenDocument.

\[19\] In some regimes, e.g., in the large and expanding U.K. equity market of the mid-nineteenth century, minority shareholders had virtually no recourse against majority shareholders (see Franks, Mayer, and Rossi (2008)), while in today’s U.S. equity markets, minority shareholders have extensive protections.
of the firm’s cash flows. Activists are more likely to act opportunistically if they internalize only a small portion of the costs their opportunistic behavior imposes on the firm. Hence, larger activists’ ownership stakes, by forcing activists to internalize more of the costs from their opportunism, will discourage such behavior. An activist will also have greater difficulty diverting a firm’s cash flows if the benefits he derives from these actions also come at the expense of other activists. Thus, actions for the exclusive benefit of any one activist are likely to be blocked and only those that benefit all activists will succeed. Consequently, activist opportunism can also be controlled by introducing multiple competing activists into a firm’s ownership structure.

Of course, both increasing an activist’s ownership stake and increasing the number of activist owners can raise the deadweight costs associated with activist ownership. Activist opportunism may also have a bright side; to the extent that activists compete with the manager to divert resources, activists who intend to divert cash flows may be more committed to monitoring the manager than activists who are unable to divert cash flows. From the owner’s perspective, there is one important reason why activist diversion may not be as bad as managerial diversion; the price an activist pays to acquire her ownership stake reflects her expected gain from opportunism. Consequently, like board opportunism, while activist opportunism can raise the deadweight costs of a governance structure featuring activist owners, the original owner does not suffer a wealth transfer; activists compensate the owner for their opportunistic gains by paying higher prices for their shares. It follows that monitor opportunism is likely to encourage firms to adopt informal governance structures featuring activist ownership over board governance.

5. Model predictions

Our analysis yields a number of empirical implications for governance and compensation policies. For example:

1. Activist ownership will be positively correlated with management compensation.

2. Activist ownership will be negatively correlated with redeployability, which can be measured by the reciprocal of Q.

3. Board independence will be negatively correlated with management compensation and redeployability, which can be measured by the reciprocal of Q.

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20See Gomes and Novaes (2001) for a similar argument. While it may be difficult and costly for the original owners/passive investors to decipher the valuation effects of the manager’s actions, it should be relatively easy for one activist to identify the private benefits from firm policy imposed by another activist.
4. Reducing the opacity of a firm’s operations, through more analyst coverage for example, will lead to lower activist ownership and increased board monitoring.

5. Reducing opacity in the aggregate, through, for example, changes in accounting regulation and disclosure requirements, will lead to activist holdings and supernormal compensation in a larger percentage of firms.

The first prediction results from the interdependence between activist ownership and managerial compensation. The second and third predictions tie a firm’s governance structure to its Q ratio. The third prediction also shows that our analysis can rationalize board passivity and high management compensation in firms with low Qs even in the absence of board capture. Thus, it indicates that regressions of performance, measured by Q, on compensation and board effectiveness cannot establish the board capture hypothesis (e.g., Bebchuk and Fried (2003) and Bebchuk and Fried (2004)). The fourth prediction is a directly testable implication of our model for the cross section of firms in a given economy. The last prediction, also unique to our model, illustrates that when activist returns are endogenously determined, cross-sectional relations cannot be generalized to cross-country or cross-time comparisons.

More generally, our derivation of the relations among the various components of the optimal governance structure has a fundamental implication for empirical corporate governance research: several of the governance mechanisms examined in this analysis exhibit strong complementarities and some act as substitutes. Therefore, linear models or models that consider one governance mechanism in isolation are likely to be poorly specified. Consider, for example, the governance literature focused on the effects of individual corporate governance mechanisms on firm performance and/or valuation. This literature includes examinations of board structure (e.g., Rosenstein and Wyatt (1990), Hermelin and Weisbach (1991), and Mehran (1995)), executive stock ownership (e.g., Morck, Shleifer, and Vishny (1988) and McConnell and Servaes (1990)), and executive compensation design (e.g., Abowd (1990), Brickley, Bhagat, and Lease (1985), Murphy (1999), and Yermack (1997)). The linear models employed in these studies imply that the effect of a governance component on firm value/performance is independent of the level at which other governance components are set. To the extent governance components can substitute or complement each other, as in our analysis, this independence assumption is violated and the tests in these papers are misspecified. In the same way, the interaction between the marginal effects of governance mechanisms and firm-specific characteristics makes it problematic to try to measure governance effectiveness with a single metric, such as the index developed in Gompers, Ishii, and Metrick (2003).
As well as casting serious doubt on some standard approaches to examining the effect of corporate governance on value, our analysis also explains a number of results in the empirical literature. For example, consistent with the evidence in Johnson, Moorman, and Sorescu (2007), we show that optimal governance mechanisms and the consequent stock market valuation depend on primitive firm and industry characteristics such as asset liquidity, intervention costs induced by asset opacity, and takeover probability. Because these determinants of the optimal governance structure are likely to vary systematically with industry, consistent with the evidence in Gillan, Hartzell, and Starks (2003), and Chidambaran, Palia, and Zheng (2006), our analysis predicts that governance structures will vary systematically across industries. A more direct link between asset characteristics and governance is provided by Bushman, Chen, Engel, and Smith (2004) who present evidence relating governance structures to the opaqueness of the firm, measured as earnings timeliness, and organizational complexity, measured by the extent of diversification. As predicted by our analysis, they find that ownership concentration varies inversely with earnings timeliness and increases with firm complexity. While these studies support our general thesis, the structure provided by our analysis facilitates a more informed and systematic interpretation of their findings. Further, our analysis provides several additional sharp research hypotheses for empirical researchers focusing on the relation between governance structures and industry and asset characteristics.

6. Conclusion

We model a world where managerial opportunism can be countered by a variety of mechanisms: the threat of asset asset redeployment, incentive compensation, activism by individual shareholders, and monitoring by an independent board. We show that the optimal governance structure for a firm that is managed by an opportunistic manager will depend on the redeployability and opacity of its assets. The governance structure will also reflect the accounting and legal regime in which the firm operates and the fungibility of its assets, all of which determine the ability of its managers, opportunistic activists, and board insiders to profit from control over the firm’s assets.

Our results demonstrate that governance through board control is not universally optimal. In fact, when assets are readily redeployable, the mere threat of redeployment together with a managerial compensation contract that incorporates a premium above his compensation from alternative employment will be the most efficient form of governance. This form of direct shareholder control is optimal despite the absence of activist shareholders in the ownership structure. Direct shareholder control is also optimal when assets are opaque and costly to redeploy. Once again, direct shareholder control is associated
with a premium built into management compensation. However, even though they do not have to actively participate in monitoring management, it is necessary for activists to be present in the ownership structure. Thus, board control is optimal only in cases where the costs of redeploying assets are moderately high and firms are not opaque. A deterioration in the legal system, while possibly enhancing the benefit from direct shareholder control, unambiguously erodes the desirability of board control. Therefore, board control is even less desirable in situations where the legal system is weak.

Finally, our results demonstrate the need for careful consideration of the resources available to support policy initiatives aimed at altering the governance environment. Because of resource constraints, the effects of changes in factors that determine governance structures can be very different effect at the firm and aggregate levels. For example, increased disclosure at the firm level by lowering opacity will encourage the adoption of board control. An economywide improvement in disclosure, however, by altering the demand for activist capital, can induce firms that rely on board governance to switch to less formal governance structures, thereby reducing the percentage of firms relying on board governance.
References


Panel A of the figure illustrates how the optimal governance regime changes for different combinations of firm profitability $\rho$, and the premium commanded by activist investors ($r_A - r$). Graphs in the top panel are for low liquidity firms, where activist capital is potentially useful. The graph on the left represents governance choices when the cost of monitoring $c = 0.07$, while that on the right is for $c = 0.095$. Dark areas represent parameters values under which imminent intervention structures are optimal, while the lighter areas represent parameter values where board monitoring is optimal. The bottom panel shows how the equilibrium activist discount rate is endogenously determined based on the demand and supply for activist capital. The supply of activist capital is inelastic and fixed at 0.20. Each demand curve is derived from the information contained in one of the graphs in Panel A of the figure. The aggregate demand for activist capital is computed by summing the value of activist stakes across the cross section of firms for the given value of $r_A - r$ in the corresponding Panel A graph. The parameter values used to generate all graphs are: $h = 0.70, l = 0.1, r = 0.24, \bar{v} = 0, \zeta = 0.01, f = 0.11, \lambda = 0.95$. 

Figure 1: The effect of scarce activist capital
This figure plots the maximum firm profitability, $\bar{\rho}$, for which the imminent intervention governance structure dominates board governance, as a function of the monitoring cost, $c$. The dot-dashed line, and the dashed line are partial equilibrium plots, where the premium commanded by activist investors, $r_A - r$, is fixed at 0.0048 and 0.024, respectively. The thicker line represents $\bar{\rho}$ when the premium commanded by activists ($r_A - r$) is endogenously determined. The supply of activist capital is inelastic and fixed at 0.1. The other parameter values used to generate the figure are: $h = 0.70, l = 0.1, r = 0.24, \bar{v} = 0, \zeta = 0.01, f = 0.11$. 

Figure 2: Governance regimes and liquidity
Appendix

Formal development of the aggregate economy model and proof of Lemma 1

We now develop in detail our small firms/large activists framework used to derivate aggregate equilibrium results in this paper. These proofs are necessary to derive Lemma 1 that demonstrates that activists can earn a return premium. This result is not very surprising but is required for the rest of our analysis. Given the pedestrian content of Lemma 1, a reader might wonder why we use such a complex continuum model of firms and so much machinery in our analysis of activism at the aggregate level. In fact, our small firms/large activists framework, which is admittedly a bit cumbersome, is necessary to dodge some rather distracting complications relating lumpiness of investments. In our model, in contrast to the neo-classical model, the firm picks the exact size of each investor’s stake as well as the price of the stake. Control over stake size is required because activist behavior varies with the size of their stake and activist capital may be expensive in equilibrium. Thus, firms have an incentive to restrict activist holding to a specific size.

However, this size restriction implies that, when activists invest in only a few firms, they have to liquidate a very large position in order to invest even one more dollar in another firm’s issue, e.g., suppose an activist with a wealth endowment of 100 is investing 50 in firm A and 50 in firm B. If firm C offers a much higher fraction of its firm in exchange for just 1 more dollar of funding, 51, accepting C’s offer would prevent the activist from buying into firms A and B and this the activist would be left with 51 invested in C and 49 in the risk-free security. Thus, the cost of one additional dollar of funds in this case is idling 49 dollars. For this reason, such an offer might be rejected. Our assumption that each activist funds a continuum of small projects avoids this complication. With a continuum of projects, when a set of firms offers the activist a better deal, the activist can continuously increase funds raised to accept new offers by cutting back on the set of old offers he is accepting. Thus, investing one more dollar in new offer requires liquidating only one dollar of investment in existing offers. Without the continuum assumption, the problem of finding a market equilibrium becomes a analytically (and perhaps numerically) intractable exercise in integer programming. The rest our development in this section is a formalization of these ideas.

There exist a continuum of firms indexed by $\omega \in \Omega$. Each firm has access to one project. The measure defined over (measurable) subsets of $\Omega$, $\nu$, is a non-atomic. The set of activist investors is given by $\{1, 2, \ldots A\}$, where $A$ is greater than $\bar{N}$. Each activist has a endowment of $\bar{P}$. Each firm, $\omega$ picks $N_A \leq \bar{N}$, the number of activist investors it desires,
and $\zeta \in (0, 1]$, the size of the “shares” sold to activists. Both activists and owners are risk neutral and their time preferences are reflected by the discount factor $\beta$. Thus, both activists and owners value a sequence of cash flows received at dates $1, 2, \ldots, t, t+1, \ldots$ at
\[ \sum_{t=1}^{\infty} \beta^t E[\tilde{x}_t]. \]  
(A-1)

The market for shares works as follows: At date 0, firms choose their ownership structure $(\zeta, N_A)$, and post the price, $P$ they will charge for one share of this issue. Activists decide which shares they plan to buy. Each activist can buy at most one share of a firm. Thus, the purchase decision of an activist is represented by an indicator function $I_a(\omega)$ taking on the value of 1 when the activist $a$ decides to buy 1 share of firm $\omega$ and 0 otherwise. A candidate equilibrium is a 4-tuple, $(\{I^*_a\}^a_{a=1}, P^*, \zeta^*, N^*_A)$, where $\{I^*_a\}^a_{a=1}$ is a collection of indicator functions, one for each activist, defined over the set of firms, $\Omega$; $P^*$ is a measurable function from the set of firms into the positive real numbers, $\zeta^*$ is a measurable function from the set of firms into $(0, 1]$, and $N^*_A$ is a measurable function from the set of firms into $\{1, 2 \ldots N\}$. Because firms cannot sell more than 100% of their equity to activists we make $\zeta^* N^*_A \leq 1$ almost everywhere with respect to $\nu$ part of our definition of a candidate equilibrium.\(^{21}\)

The intervention strategy played by activists determines the stream of expected cash flows resulting from buying firm $\omega$. Represent the value of this stream of cash flows with $u^*(\omega, \zeta, N_A)$. This cash flow includes both the cash flows from the shares and any costs associated with monitoring. The payoff for an activist from an initial purchase decision of $I$, given security prices $P$, is equal to
\[ U_a(I, P, \zeta, N_A) = P + \int I_a(\omega) [u(\omega, \zeta, N_A) - P(\omega)] d\nu(\omega). \]  
(A-2)

The value of a firm to its initial owner, assuming its share is purchased by activists, equals the discounted value of the firm, $\phi(\omega)$. The payoff to initial owners who sell $N_A$ shares of size $\zeta$ equals their remaining share in the firm less the cost of the initial investment, 1, plus the funds the receive from activist investors, $N_A P(\omega)$. This value is given by
\[ W(P, \omega, \zeta, N_A) = (1 - \zeta N_A)\phi(\omega) - (1 - P N_A). \]  
(A-3)

For ownership structures to be optimal for firms, it is necessary that firms cannot

\(^{21}\)All conditions relating restricting the behavior of sets or functions defined over the set of firms that we will impose below hold almost everywhere, that is the $\nu$-measure of the set over which they fail is 0. To avoid tedium, we will omit the “almost everywhere” qualifier in our subsequent analysis.
pick alternative capital structures involving share issues that increase both initial owner as well as activist welfare. To formalize this idea, we define the concept of a beneficial deviation. A profitable deviation against a candidate equilibrium which produces payoffs, $W^*(\omega)$ to firms and $\{U^*_a\}_a$ to activists, consists of a measurable subset of firms, $\mathcal{D}'$, and integer $N'$, a pricing function $P' : \mathcal{D} \to [0, \infty)$, and a nonempty subset of activists $\mathcal{A}'$ containing with the following properties:

$$v(\mathcal{D}') > 0 \text{ and } W'(P'(\omega), \omega, \zeta'(\omega), N'(\omega)) > W^*(\omega) \text{ whenever } \omega \in \mathcal{D}' .$$

(A-4)

For each $a \in \mathcal{A}'$ there exists an indicator function $I'_a$ such that

$$\int_{\mathcal{D}'} [u(\omega, \zeta'(\omega), N'(\omega)) - P'(\omega)] d\nu(\omega) + \int_{\mathcal{D}'} [u_a(\omega) - P^*(\omega)] I'_a(\omega) d\nu(\omega) > U^*_a,$$

(A-5)

and

$$\int_{\mathcal{D}'} P'(\omega) d\nu(\omega) + \int_{\mathcal{D}'} P^*(\omega) I'_a(\omega) d\nu(\omega) \leq \bar{P}.$$  

(A-6)

If a profitable deviation exists, a subset of firms can offer activists securities at prices which engender a higher payoff to both activists and firms in the subset. Moreover, activists have sufficient funds to buy the new securities through rebalancing their portfolio of old securities at their equilibrium prices. An equilibrium is a candidate configuration in which the following conditions are satisfied:

$$\sum_{j=1}^{\bar{N}} I'_a(\omega) = N'_A(\omega),$$

(A-7a)

$$U_a(I'_a, P^*, \zeta^*, N'_A) = \max_I U_a(I, P^*, \zeta^*, N'_A) \text{ s.t. } \int I(\omega) P^*(\omega) d\nu(\omega) \leq \bar{P},$$

(A-7b)

There exists no profitable deviation from $\{I_a^*, P^*, \zeta^*, N_A^*\}$.  

(A-7c)

Condition (A-7a) ensures that all shares offered are purchased. Condition (A-7b) ensures that activist investors select the budget feasible investment policy that maximize their payoff, given the menu of investments supplied by firms. Equation (A-7c) ensures that firms cannot profitably induce activists to subscribe to alternative ownership structures.

**Lemma A.1.** If $\{I_a^*, P^*, \zeta^*, N_A^*\}$ is an equilibrium, then there exists a $\gamma^* \geq 0$ such that

$$P^*(\omega) = \frac{U^*(\omega)}{1 + \gamma^*} \text{ whenever } N_A^*(\omega) > 0.$$

(A-8)
Proof of Lemma A.1

Consider the following relaxed optimization problem. Let $\mathcal{H}$ be the set of all measurable functions defined over $\Omega$, whose range is contained by the unit interval $[0, 1]$. Consider the problem

$$
\max_{h \in \mathcal{H}} \bar{P} + \int h(\omega) [u^*(\omega) - P^*(\omega)] d\nu(\omega),
\int h(\omega) P^*(\omega) d\nu(\omega) \leq \bar{P}.
$$

(A-9)

This problem is a standard infinite-dimensional linear programming problem which must, by standard duality theorems, satisfy its Kuhn-Tucker conditions, i.e., let $L$ represent the Lagrangian of (A-9) given by

$$
L(\omega) = \int h(\omega) [u^*(\omega) - (1 + \gamma)P^*(\omega)] d\nu(\omega) + \bar{P} (1 + \gamma).
$$

(A-10)

Then, for some $\gamma^* \geq 0$, it must be the case that the solution to (A-9) maximizes the Lagrangian expression given by (A-10). Let $h^*$ be a solution to this problem. The Kuhn-Tucker conditions show that it must be the case that $h^o = 1$ whenever $u^*(\omega) - (1 + \gamma)P^*(\omega) > 0$, and $h^o = 0$ whenever $u^*(\omega) - (1 + \gamma)P^*(\omega) < 0$.

In any equilibrium, the security purchase of activists must satisfy the condition that $I_a^*(\omega) = 0$ whenever $u_a^*(\omega) - P^*(\omega) < 0$, for all activists $a$. Thus, in order for (A-7a) to be satisfied we must have $u^*(\omega) - P^*(\omega) \geq 0$. Note also that the highest feasible payoff to firms, ignoring the budget constraint, is obtained by buying all the securities offered by the firms, i.e., setting $I = I_\Omega$,

$$
\bar{P} + \int [u^*(\omega) - P^*(\omega)] d\nu(\omega),
$$

(A-11)

and the lowest feasible payoff is $\bar{P}$. Next note that, because $\nu$ is nonatomic, by Lyapunov's theorem, the set of feasible payoffs is an interval, that is the set of values produced by all indicator functions, $I$, defined on $\Omega$, for the integral

$$
\int I [u^*(\omega) - P^*(\omega)] d\nu(\omega),
$$

(A-12)

is an interval with lower endpoint $\bar{P}$ and its upper endpoint given by (A-11). The value
of the optimized relaxed problem

$$\int h^* [u^*(\omega) - P^*(\omega)] \, d\nu(\omega)$$

(A-13)

lies within this interval. Hence, there exists an indicator function, $I^o$ such that

$$\int h^* [u^*(\omega) - P^*(\omega)] \, d\nu(\omega) = \int I^o [u^*(\omega) - P^*(\omega)] \, d\nu(\omega).$$

(A-14)

This indicator function is a solution to the relaxed problem and thus must satisfy the Kuhn-Tucker conditions. Hence, it must be the case that for almost all firms,

$$u^*(\omega) - (1 + \gamma)P^*(\omega) > 0 \Rightarrow I^o = 1,$$

and

$$u^*(\omega) - (1 + \gamma)P^*(\omega) < 0 \Rightarrow I^o = 0.$$

(A-15)

Now this indicator function is a feasible solution to the original (non-relaxed) problem and the original problem cannot have a value higher than the solution to the relaxed problem. Thus, $I^o$ is an optimal solution to the original problem. That is, the solution to the original problem produces a payoff of

$$\int \int I^o [u^*(\omega) - P^*(\omega)] \, d\nu.$$ (A-16)

Since indicator functions that do not satisfy (A-15) produce a strictly lower value for the relaxed problem and are feasible for the original problem they must produce a strictly lower value for the original problem than $I^o$. Thus we see that all solutions to the original problem defined by condition (A-7b) must satisfy (A-15). In order for condition (A-7a) to be satisfied which requires that number of investors who subscribe to the issue to both be positive and no more than than the number sought, $N_A^*$, it must be the case that when $N_A^* > 0$, $u^*(\omega) - (1 + \gamma)P^*(\omega) = 0$. □

**Proposition A.1.** In any equilibrium, firm ownership structures maximizes, for the $\gamma^* \geq 0$ defined in Lemma A.1 the following function:

$$(1 - \zeta N_A)\phi(\omega, \zeta, N) - \left( 1 - N \frac{U(\omega, \zeta, N)}{1 + \gamma^*} \right).$$

(A-17)
Proof of Proposition A.1

Suppose that a set of firms, of positive measure, \( \mathcal{D}' \), did not satisfy this condition. Then, for such firms, there would exist an alternative ownership structure \( (\zeta', N') \) such that

\[
U^*(\omega) = (1 - N_A^*(\omega) \zeta^*(\omega)) \phi(\omega, \zeta, N_A) - \left( 1 - N_A \frac{U(\omega, \zeta^*(\omega), N_A^*(\omega))}{1 + \gamma^*} \right) < \\
(1 - N'(\omega) \zeta'(\omega)) V(\omega, \zeta'(\omega), N'(\omega)) - \left( 1 - N_A \frac{U(\omega, \zeta'(\omega), N'(\omega))}{1 + \gamma^*} \right).
\]

(A-18)

This inequality implies that firms in \( \mathcal{D}' \) can pick a price \( P'(\omega) \) such that

\[
P'(\omega) < \frac{u(\omega, \zeta'(\omega), N'(\omega))}{1 + \gamma^*},
\]

(A-19)

\[
W^*(\omega) < W(\omega, P'(\omega), \zeta'(\omega), N'(\omega)).
\]

(A-20)

Let

\[
P^o(\omega) = \begin{cases} 
P^*(\omega) & \omega \notin \mathcal{D}', \\
P'(\omega) & \omega \in \mathcal{D}'.
\end{cases}
\]

(A-21)

\[
\zeta^o(\omega) = \begin{cases} 
\zeta^*(\omega) & \omega \notin \mathcal{D}', \\
\zeta'(\omega) & \omega \in \mathcal{D}'.
\end{cases}
\]

(A-22)

\[
N^o(\omega) = \begin{cases} 
N^*(\omega) & \omega \notin \mathcal{D}', \\
N'(\omega) & \omega \in \mathcal{D}'.
\end{cases}
\]

(A-23)

\[
u^o(\omega) = u(\omega, \zeta^o(\omega), N^o(\omega)).
\]

(A-24)

Following the proof of Lemma A.1, one can form the Lagrangian for the equivalent relaxed optimization problem of maximizing the payoff of activists given \((P^o(\omega), N^o(\omega), \zeta^o(\omega))\) subject to their budget constraint in exactly the same way as in Lemma A.1. This yields

\[
L^o(h) = \int h(\omega) \left( \frac{u^o(\omega)}{P^o(\omega)} - (1 + \gamma^o) \right) P^o(\omega) d\nu(\omega) + \tilde{P} (1 + \gamma^o).
\]

(A-25)

By Lemma A.1, \( u^o(\omega)/P^o(\omega) = (1 + \gamma^*) \) for all \( \omega \in \mathcal{D}' \) and \( u^o(\omega)/P^o(\omega) > (1 + \gamma^*) \) for all \( \omega \notin \mathcal{D}' \). Thus, maximization of the Lagrange the solution, \( h^o \) must equal 1 over some subset of \( \mathcal{D}' \) of positive measure. Consequently, activists can increase their payoff.
by accepting contracts in this subset relative to their equilibrium payoff. At the same
time, inequality A-20 ensures that firms can increase their payoff. Thus, the conditions
for a profitable deviation are satisfied contradicting the equilibrium conditions. This
contradiction establishes the Theorem. □

Proofs of propositions on governance structures.

Proof of Proposition 1

Note that with a board of directors, activists are not required in the ownership struc-
ture. Therefore, the board always monitors and the manager never diverts cash flows.
The wage paid to the manager is $w$ in the $H$ state, and $0$ in the $L$ state. In every period,
residual cash flows net of the manager’s wage and the periodic board monitoring cost
accrue to the original owner in the amount:

$$\rho (h - w) + (1 - \rho) l - c.$$  \hspace{1cm} (A-26)

The present value of this stream of periodic cash flows to the original owner is

$$V_F = \frac{\rho (h - w) + (1 - \rho) l - c}{r},$$  \hspace{1cm} (A-27)

$$= \frac{rV - \rho w - c}{r}.$$

It can be seen that the firm value in (A-27) is decreasing in $w$, the manager’s wage, and
it is hence optimal to set the wage at the minimum value possible, i.e., at the manager’s
reservation value, such that

$$\rho w = \bar{v}.$$

Substituting this optimal wage into (A-27), we have

$$V_F = \frac{rV - \bar{v} - c}{r},$$  \hspace{1cm} (A-27)

$$= \frac{\bar{v}}{r} - \frac{c}{r},$$

which is the expression in (2). □

Proof of Lemma 1

Based on Lemma A.1 and Proposition A.1, we need only note that in all equilibria,
expected cash flows are the same in every period. Thus, the value of of cash flows to
the initial owners is given by the perpetuity formula. The rate of return for the original owners, by definition, is equal to reciprocal of one plus the discount factor. Thus, by definition, \(1/r = \beta/(1 - \beta)\). From Lemma A.1, the price of cash flows bought by activists is \((1 + \gamma^*)^{-1}\) times their value to owners. Thus, the value of the firm to an activist is determined by multiplying the expected period cash flow by 

\[
\frac{\beta}{(1 - \beta)(\gamma + 1)}. \tag{A-28}
\]

By the definition of \(r_A\), we see that 

\[
\frac{1}{r_A} = \frac{\beta}{(1 - \beta)(\gamma + 1)}. \tag{A-29}
\]

\[\Box\]

**Proof of Proposition 2**

First, we show intervention and diversion must be random. Intervention with probability one eliminates all gains to the manager from attempting to divert cash flows. Thus, his best response to activists always intervening is to stop attempting to divert cash flows. However, if the manager chooses not to divert, the activist’s best response is to eschew intervention. If activists intervene with probability 0, for any wage \(w < h - l\), the manager’s best response is to divert. However, intervening with probability 0 is not a best response to the manager’s optimal strategy. Thus, activists must intervene with a probability in \((0, 1)\).

If the manager diverts with probability one, the activists will intervene with probability one, which would render diverting sub-optimal for the manager. If the manager diverts with probability zero, the activists’ best response is to eschew intervention. However, the manager’s strategy is not a best response to this activist strategy. Thus, the manager’s diversion probability must be in \((0, 1)\).

Let \(\theta\) represent the probability that the manager attempts to divert in a given period, and let \(\pi\) be the probability with with each activist investor intervenes in each period. It follows that, with \(N_A\) activists, each of whom independently makes her intervention decision, the probability that at least one activist intervenes is given by:

\[
\Pi = 1 - (1 - \pi)^{N_A}. \tag{A-30}
\]
Then, the manager’s expected payoff if he diverts is:

\[ \rho \Pi w + \rho (1 - \Pi) (h - l) - f, \quad (A-31) \]

and the manager’s expected payoff if he does not divert is:

\[ \rho w, \quad (A-32) \]

The manager to be willing to randomize between diverting and abstaining, if he is indifferent between these two alternatives. From (A-31) and (A-32), it follows that the manager will be willing to randomize if

\[ 1 - \Pi^* = \frac{f}{rV - l - \rho w}. \quad (A-33) \]

Note that if the manager is indifferent between diverting and abstaining, from (A-32), the present value of his expected stream of future payoffs can be written as

\[ V_{M,I} = \frac{\rho w}{r}. \quad (A-34) \]

To randomize between intervening and not intervening, each activist has to be indifferent between the two alternatives. Let \( E_m \) represent an activist’s expected end-of-period payoff to each activist conditional on at least one activist intervening, and let \( E_{nm} \) represent an activist’s expected end-of-period payoff in the absence of any intervention. It follows that \( E_m \) and \( E_{nm} \) can be written as:

\[
E_m = \zeta (rV - \rho w), \quad \text{and,} \\
E_{nm} = E_m - \theta \zeta (rV - l - \rho w). \quad (A-35)
\]

Then, if \( 1 - \tau = (1 - \pi)^{N_a - 1} \) represents the probability that none of the remaining activists monitor, the indifference condition for an individual activist can be written as:

\[ [\tau E_m + (1 - \tau) E_{nm}] = E_m - c. \quad (A-37) \]

Because each activist is indifferent between intervening and not intervening, from (A-37) it follows that the probability with which the manager diverts must satisfy

\[ \theta = \frac{c}{\zeta (1 - \tau) (rV - l - \rho w)}. \quad (A-38) \]
From (A-33) and (A-38) it follows that for activists to be willing to randomize, it must be the case that
\[ 1 - \pi = \frac{\zeta f \theta}{c}. \] (A-39)

Using this relationship between the probability of intervention by activists and the probability of diversion by the manager, we can characterize the present value of expected cash flows to activists as
\[ V_{A,I} = \left[ \frac{\zeta (r V - \rho w) - c}{r_A} \right] N_A, \] (A-40)

and the present value of expected cash flows to the original owner as
\[ V_{P,I} = \frac{(1 - \zeta N_A)}{r} \left[ (r V - \rho w) - \frac{c}{\zeta} (1 - \pi) \right], \]
\[ = \frac{(1 - \zeta N_A)}{r} \left[ (r V - \rho w) - \frac{c}{\zeta} \left( \frac{f}{r V - l - \rho w} \right)^{\frac{1}{N_A}} \right]. \] (A-41)

Therefore, firm value is given by the sum of the two above expressions as
\[ V_{F,I} = \left[ \frac{\zeta N_A}{r_A} + \frac{1 - \zeta N_A}{r} \right] (r V - \rho w) - \frac{c N_A}{r_A} - \frac{c (1 - \zeta N_A)}{\zeta r} \left( \frac{f}{r V - l - \rho w} \right)^{\frac{1}{N_A}}. \] (A-42)

To characterize the stationary equilibrium, we have to solve the following program:

\[ \max_{w,N_A} V_{F,I}, \]
\[ \text{s.t. } \rho w \geq \bar{v}, \] (A-43)
\[ V_{A,I} = \left[ \frac{\zeta (r V - \rho w) - c}{r_A} \right] N_A \geq \zeta N_A, \] (A-44)
\[ \theta = \frac{c}{\zeta f} \left( \frac{f}{r V - l - \rho w} \right)^{\frac{1}{N_A}} \leq 1, \] (A-45)
\[ \zeta \geq \zeta. \] (A-46)

First, note that the constraints (A-44) and (A-45) become tighter as one increases \( w \), while the constraint (A-46) is unaffected. Now, it can be easily established, by means of the following argument that the constraint (A-43) binds. Now note that the objective function in (A-42) is decreasing in \( w \), i.e.,
\[ \frac{\partial V_{F,I}}{\partial w} = -\rho \left[ \frac{\zeta N_A}{r_A} + \frac{1 - \zeta N_A}{r} \right] - \frac{c (1 - \zeta N_A) \rho}{r f \zeta N_A} \left( \frac{f}{r V - l - \bar{v}} \right)^{\frac{1}{N_A} + 1} < 0. \] (A-47)
Then, by the following argument, it is optimal to set $\rho w = \bar{v}$: suppose that $w^*$ is part of the solution and (A-43) does not bind. Decreasing $w$ is feasible because constraints (A-44) and (A-45) become looser when lowering $w$. Further, the objective function is increased by reducing $w$. This contradicts our initial supposition. Thus, in equilibrium the manager’s equilibrium compensation contract $w^*$ ensures that he earns his reservation wage of $\bar{v}$ in every period. That is, the present value of the manager’s payoff from employment with the firm, $V_{M,I}$ is given by

$$V_{M,I} = \frac{\rho w^*}{r} = \frac{\bar{v}}{r}. \quad (A-48)$$

Using (A-48) to substitute for $w$ in (A-33) and simplifying, we obtain (5). Substituting similarly for $w$ in (A-37) and simplifying, we obtain (6). □

**Proof of Proposition 3**

First note that firm value in any stationary equilibrium is given by (4). The first derivative of this expression with respect to the number of activists, $N_A$, is

$$\frac{\partial V_{F,I}}{\partial N_A} = \zeta (r\mathcal{V} - \bar{v}) \left[ \frac{1}{r_A} - \frac{1}{r} \right] - \frac{c}{r_A} + \frac{c(1 - \Pi)^{\frac{1}{2}}}{r} \left[ \zeta + \frac{(1 - \zeta N_A) \log(1 - \Pi)}{N_A^2} \right]$$

$$= [\zeta (r\mathcal{V} - \bar{v}) - r] \left[ \frac{1}{r_A} - \frac{1}{r} \right] - \frac{c\pi}{r} + \frac{c(1 - \pi)(1 - \zeta N_A)}{r\zeta N_A^2} \log(1 - \Pi) < 0$$

Thus, it is evident that, if unconstrained, it is optimal to set the number of activists to its minimum possible value, $N_A = 1$. Note also that while constraints (A-44) and (A-46) are unaffected by changes in $N_A$, constraint (A-45) is loosened as one decreases $N_A$. To see this, note that

$$\frac{\partial \theta}{\partial N_A} = -\frac{c}{\zeta f N_A^2} (1 - \pi) \log(1 - \Pi) > 0. \quad (A-49)$$

Thus, setting $N^*_A = 1$ is optimal.

Given this result, the revised program for finding the optimal firm ownership structure is

$$\max_{\zeta} \left[ \frac{\zeta}{r_A} + \frac{1 - \zeta}{r} \right] (r\mathcal{V} - \bar{v}) - \frac{c}{r_A} - \frac{c(1 - \zeta)}{r\zeta} \left( \frac{f}{r\mathcal{V} - l - \bar{v}} \right)$$

s.t. $$\frac{\zeta (r\mathcal{V} - \bar{v}) - c}{r_A} \geq \zeta, \quad (A-50)$$

$$\theta = \frac{c}{\zeta (r\mathcal{V} - l - \bar{v})} \leq 1, \quad (A-51)$$

$$\zeta \geq \zeta. \quad (A-52)$$
The constraint on $\theta$ in (A-51) can never bind. To see this, note that if $\theta = 1$, because the value of the activist’s payoff if she does not intervene is $\frac{\zeta l}{r_A}$ and the activist is indifferent between intervening and not intervening, the value of the activist’s claim is equal to

$$V_{A,I} = \frac{\zeta(rV - \bar{v}) - c}{r_A} = \frac{\zeta l}{r_A}.$$  \hspace{1cm} (A-53)

By Assumption 4, this implies that investing in the firm yields a negative NPV for the activist, and thus, the activist will not participate in financing the firm when $\theta = 1$.

Therefore, the final program is

$$\max_{\zeta} \left[ \frac{\zeta}{r_A} + \frac{1 - \zeta}{r} \right] (rV - \bar{v}) - \frac{c}{r_A} - c \frac{(1 - \zeta)}{r} \left( \frac{f}{rV - l - \bar{v}} \right)$$

s.t. $\frac{\zeta(rV - \bar{v}) - c}{r_A} \geq \zeta$, \hspace{1cm} (A-54)

$\zeta \geq \zeta$, \hspace{1cm} (A-55)

$\zeta \leq 1$. \hspace{1cm} (A-56)

This program implies that the optimal activist ownership stake, $\zeta^*$ is given by the maximum of a) the maximum $\zeta$ from the constraint in (A-55), b) the value of $\zeta$ that just solves the constraint in (A-54), c) the solution to the unconstrained maximand in the above program, and d) the condition that $\zeta^* < 1$ given by (A-56). Writing the first order condition for the unconstrained optimization problem and equating to zero, we have

$$\frac{\partial V_{F,I}}{\partial \zeta} = (rV - \bar{v}) \left( \frac{1}{r_A} - \frac{1}{r} \right) + \frac{c}{r} \left( \frac{f}{rV - l - \bar{v}} \right) \frac{1}{\zeta^2} = 0,$$

which implies that the unconstrained solution solves $\zeta^2 = \frac{cf}{(rV - l - \bar{v})} \frac{r}{(1 - \frac{r}{r_A})(rV - \bar{v})}$. \hspace{1cm} (A-57)

Combining the values from a), b) , c) and d) above, we arrive at the expression for the optimal control fraction.

$$\zeta^* = \min \left[ \max \left( \frac{\zeta}{rV - r_A - \bar{v}}, \left[ \frac{cf}{(rV - l - \bar{v})} \left( \frac{r}{r_A} \right) (rV - \bar{v}) \right]^{\frac{1}{2}} \right), 1 \right]. \hspace{1cm} (A-58)$$

As one can see by inspecting (A-58), whenever $r_A$ is sufficiently large relative to $r$, $\zeta^* < 1$.\hfill \Box
Proof of Proposition 4

Let \( w_e \) be the manager’s wage if has not diverted resources in the past. The first instance of diversion by the manager or intervention by activists starts a subgame that is virtually identical to the stationary (intervention) equilibrium described above. Let \( w_o \) be the manager’s wage in this subgame. Thus, we first have to solve for the optimal wage \( (w_o) \), diversion probability \( (\theta_o) \), and intervention probability \( (\pi_o) \), taking \( \zeta \) and \( N_A \) as fixed. Then, taking this solution, we solve for the optimal \( \zeta \) and \( N_A \) in the supergame.

Consider the constraints on the governance structure that apply in the subgame that begins with the first diversion by the manager or deviation from the strategy of not monitoring by activists. First, from the activists’ point of view, redeployment must be inferior to letting the manager divert unchecked every period, i.e,

\[
1 - \lambda \leq \frac{l}{r_A}.
\]

Note that the above condition also implies that redeployment is inferior from the original owner’s point of view, as

\[
1 - \lambda \leq \frac{l}{r_A} \leq \frac{l}{r}.
\]

Second, randomized intervention must be preferred to letting the manager divert unchecked in every future period, which implies

\[
\frac{[\zeta (rV - \rho w_o) - c] N_A}{r_A} \geq \frac{\zeta N_A l}{r_A}.
\]

Third, the manager must be paid at least his reservation wage off the equilibrium path, i.e.,

\[
\rho w_o \geq \bar{v}.
\]

Finally, the probabilities of intervention and diversion must be well-behaved, i.e,

\[
1 - \Pi_o = \frac{f}{rV - l - \rho w_o} \leq 1,
\]

and

\[
\theta_o = \frac{c}{\zeta f} \left( \frac{f}{rV - l - \rho w_o} \right)^{\frac{1}{N_A}} \leq 1.
\]

Note that this problem is virtually identical to the one we solved earlier. The only difference is on the right hand side of the NPV conditions for activists, i.e., the right hand side of (A-44) versus the right hand side of (A-59), and this change has no effect on the
argument for setting the equilibrium wage. Consequently it has to be the case that the
manager’s off-equilibrium reservation constraint must bind in the subgame, i.e., $\rho w_o = \bar{v}$.

Coming to the supergame in equilibrium, we need the following conditions to be satisfied. First, we need that activists do not deviate and intervene, which implies

$$\frac{\zeta N_A (r V - \rho w_e)}{\rho r_A} \geq \frac{[\zeta (r V - \bar{v}) - c] N_A}{\rho r_A}.$$

Further, because

$$\frac{\zeta N_A (r V - \rho w_e)}{r} \geq \frac{[\zeta (r V - \bar{v}) - c] N_A}{\rho r_A} \geq \frac{\zeta N_A l}{r_A} \geq \zeta N_A (1 - \lambda),$$

it follows that

$$\frac{(1 - \zeta N_A) (r V - \rho w_e)}{r} \geq (1 - \zeta N_A) (1 - \lambda),$$

which implies that the original owner will not deviate and try to redeploy assets.

Next, the manager must not deviate and divert. Note that if the manager decides to
deviate from the equilibrium strategy and divert, he incurs a cost $f$, and with probability $\rho$ captures the cash flow of $h - l$ in the current period. However, with probability $\rho$ the present value of his future compensation is $\frac{\bar{v}}{r}$. With probability $1 - \rho$ he receives zero in this period, and $\rho w_e$ in each future period. Thus, the manager’s expected payoff if he deviates from his equilibrium strategy and diverts is

$$\rho (h - l) - f + \rho \left(\frac{\bar{v}}{r}\right) + (1 - \rho) \frac{\rho w_e}{r}.$$

If the manager does not divert, his expected payoff is

$$\rho w_e \left(1 + \frac{1 + r}{r}\right).$$

Following the equilibrium strategy is incentive compatible for the manager if his payoff
from not deviating is at least as large as his payoff from deviating. That is,

$$\rho w_e \geq \frac{r (r V - l - f) + \rho \bar{v}}{r + \rho} \geq \bar{v}. $$

Note that the aggregate value to investors is decreasing in $w_e$ and the constraint (A-63),
the only constraint on $w_e$, is loosened by lowering $w_e$. Consequently, the manager’s wage
must be set at its minimum possible value in equilibrium, i.e.,

$$\rho w_e^* = \frac{r(rV - l - f) + \rho \bar{v}}{r + \rho}. \quad (A-67)$$

This implies that the manager receives an “efficiency wage”, and the present value of his periodic wage payments is

$$B = \frac{\rho w_e^* - \bar{v}}{r} = \frac{rV - \bar{v} - l - f}{r + \rho}. \quad (A-68)$$

Thus, collecting all the constraints, the firm’s optimal ownership structure is the solution to the following problem:

$$\max_{\zeta, N_A} V_{F,E} = \left[ \frac{\zeta N_A}{r_A} + \frac{1 - \zeta N_A}{r} \right] \left[ r(V - B) - \bar{v} \right], \quad (A-69)$$

s.t. \( \zeta \leq \frac{c}{rB} \), \( \zeta \geq \frac{c}{rV - l - \bar{v}} \), \( \zeta \geq \frac{c}{(rV - l - \bar{v}) \left( \frac{f}{rV - l - \bar{v}} \right)^{N_A - 1}} \), \( \zeta \geq \frac{\zeta}{r_A} \), \( 1 - \lambda \leq \frac{l}{r_A} \). \quad (A-70, A-71, A-72, A-73, A-74)

In the above problem, the maximand is simply firm value when the present value of the premium received by the manager is \( B \). The first constraint is condition (A-63) with the equilibrium wage substituted in. The second constraint is (A-59) with the off-equilibrium wage substituted in. The next constraint restricts the probability of diversion in the subgame, \( \theta \), to be no greater than one, given the optimal choice of \( \zeta \) and \( N_A \) in the supergame. The fourth constraint is the restriction on the minimum stake per activist. The last constraint ensures that redeployment is suboptimal even off the equilibrium path.

Because \( \frac{f}{rV - l - \bar{v}} < 1 \) by Assumption 3, the right hand side of (A-72) is larger than the right hand side of (A-71), ensuring that (A-71) is redundant.

To solve the problem, we characterize the solution to the problem ignoring constraint (A-70). Then, we show that this constraint is always satisfied by the proposed solution to the relaxed problem.

Note that \( V_{F,E} \) is a non-increasing function of \( N_A \) and is strictly decreasing in \( N_A \).
when \( r_A > r \). This is clear from the following derivative:

\[
\frac{\partial V_{F,E}}{\partial N_A} = \zeta \left( \frac{1}{r_A} - \frac{1}{r} \right) \left[ r (V - B) - \bar{v} \right] < 0 \tag{A-75}
\]

Further, all the constraints are unaffected by changing \( N_A \). Thus, in the relaxed problem the optimal number of activists is \( N_A^* = 1 \), and this is only optimal solution if \( r_A > r \).

Next note that \( V_{F,E} \) is non-increasing in \( \zeta \), and strictly is decreasing when \( r_A > r \) which implies that an optimal solution is to set \( \zeta \) equal to its minimum possible value in the solution, i.e., because \( N_A^* = 1 \), from (A-72) and (A-73) at

\[
\zeta^* = \max \left[ \zeta, \frac{c}{rV - l - \bar{v}} \right]. \tag{A-76}
\]

Moreover, when \( r_A > r \), this is the only optimal solution for \( \zeta \).

Now we show that the above solution satisfies constraint (A-70). Note that

\[
\frac{c}{rB} = \frac{c}{rV - l - f - \bar{v}} \left( \frac{r + \rho}{r} \right) \geq \frac{c}{rV - l - f - \bar{v}} \geq \frac{c}{rV - l - \bar{v}}
\]

Thus, by condition (8) and the definition of \( \zeta^* \) above, it follows that (A-70) is non-binding.

To complete the proof, note that investors (both activists and the original owner) have to be willing to capitalize the firm. They will be willing to do so as long as their investment of $1 has a non-negative NPV. A sufficient condition for this is

\[
\frac{rV - \rho w^*_e}{r_A} = \frac{r (V - B) - \bar{v}}{r_A} \geq 1. \tag{A-77}
\]

This, along with a sufficient condition for (A-70), is the condition in (8). \( \square \)

**Proof of Proposition 5**

In imminent redeployment equilibria, the first time the manager is caught diverting, the owner redeployed assets. Because activist ownership in not required to redeploy assets, in all such equilibria, firm value is maximized when the original owner is the only shareholder, i.e, \( N_A = 0, \zeta = 0 \).

If the manager diverts, the owner have two alternatives–he can choose to continue to remain invested in the firm, or he can redeploy assets. We assume that managerial diversion causes the owner to switch from believing that the manager will never divert believing that the manager will divert in every future period. Thus, if the owner continues to remain invested, he can at best expect to earn \( l \) in every future period and thus the
value of his claims is at most $\frac{l}{r}$. If the owner chooses to redeploy assets, he receives a payoff of $1 - \lambda$. Thus, so long as (12) is satisfied, redeploying assets after the manager diverts for the first time is optimal from the owner’s perspective.

To ensure that the manager chooses to stay employed with the firm, he must receive at least his reservation wage in every period. As is the case in imminent intervention equilibria, following the equilibrium strategy is incentive compatible for the manager if his payoff from not deviating is at least as large as his payoff from deviating, following which assets are redeployed and he earns his reservation wage of $\bar{v}$ in every future period. Therefore the equilibrium wage, $w^*$, satisfies:

$$\rho w^* \geq \bar{v} + rB.$$  \hspace{1cm} (A-78)

Further, the original owner has to be willing to capitalize the firm, and will only do so if his expected payoff exceeds his investment, i.e.,

$$\mathcal{V} - \frac{\rho w^*}{r} \geq 1.$$  \hspace{1cm} (A-79)

Finally, the owner should not deviate and redeploy assets if the manager has not diverted, i.e.,

$$\mathcal{V} - \frac{\rho w^*}{r} \geq 1 - \lambda.$$  \hspace{1cm} (A-80)

Note that (A-79) implies (A-80). Further, the original owner’s payoff is decreasing in the manager’s wage and (A-79) is loosened by lowering the manager’s wage. Thus, it is optimal to set $\rho w^* = \bar{v} + rB$. The proof is completed by noting that Condition (13) is then simply (A-79), upon substitution for $w^*$. □

**Proof of Proposition 6**

First, to establish that firm value is higher under board control than in the intervention equilibria, note that, if $\Delta$ represents the value of the firm under board control less the value of the firm in the intervention equilibria

$$\Delta = \frac{1}{r} \left( r\mathcal{V} - \bar{v} - c \right) - \left[ \frac{\zeta}{r_A} + \frac{1 - \zeta}{r} \right] \left( r\mathcal{V} - \bar{v} \right) + \frac{c(1 - \zeta)}{r_0} \left( \frac{f}{r\mathcal{V} - l - \bar{v}} \right),$$

$$= \left[ \zeta (r\mathcal{V} - \bar{v}) - c \right] \left[ \frac{1}{r} - \frac{1}{r_A} \right] + \frac{c(1 - \zeta)(1 - \Pi)}{r_0} > 0.$$  

Next, we establish our claim regarding the optimality of imminent intervention. To see the validity of our claim, note that when the cost of redeploying assets is relatively high,
imminent redeployment is infeasible. Thus, to prove our claim, we need only demonstrate
that firm value under imminent intervention is higher than firm value under board control.
To see that firm value is higher in the imminent intervention equilibrium, note that
\[
\left[ \frac{\zeta}{r_A} + \frac{1 - \zeta}{r} \right] (rV - \bar{v} - rB) - \frac{1}{r} (rV - \bar{v} - c)
\] (A-81)
is positive for sufficiently small \(B\) and \(r_A - r\). Further, it is obvious that for sufficiently
small \(B\) and \(r_A - r\) the two conditions for the existence of imminent intervention equilibria,
(7) and (8) are satisfied. This proves the second part of the proposition.

Finally, we establish our claim regarding the optimality of imminent redeployment.
To see the validity of our claim note that, when the cost of redeploying assets is relatively
low, imminent intervention is not feasible. Thus, to prove the claim, we demonstrate that
firm value under imminent redeployment is higher than firm value under board control.
To see this, note that
\[
\frac{1}{r} (rV - \bar{v} - rB) - \frac{1}{r} (rV - \bar{v} - c)
\] (A-82)
is positive for sufficiently small \(B\). Further, when \(B\) and \(\lambda\) are sufficiently small, both
the conditions for existence of imminent liquidation equilibria, (12) and (13) are satisfied.
This establishes the final part of the Proposition. □