

Strong Managers, Weak Boards?*

Renée B. Adams[†] and Daniel Ferreira[‡]

Abstract

Many governance reform proposals are based on the view that boards have been too friendly to executives, for example, by awarding them excessive pay. Although boards are often on friendly terms with executives, it is less clear that they have systematically failed to function in the interests of shareholders. Understanding board monitoring requires a theory of boards that takes into account how firms provide incentives for their Chief Executive Officer's (CEOs) through other means. We develop a model in which a CEO's ownership stake and private benefits have opposite effects on his willingness to share private information with an independent board of directors. To encourage the CEO to communicate, the board may optimally commit to a low monitoring intensity when either CEO ownership is low or private benefits are high. Our model suggests that the existing cross-section evidence on the correlation between board composition and CEO ownership and tenure needs re-evaluation. Using a new proxy for board monitoring, we provide new evidence that this cross-sectional correlation appears to be non-monotonic, with board independence first decreasing and then increasing in CEO ownership and tenure. We discuss the implications of our model for the design and evaluation of governance structures. (JEL codes: G34, L22, J41, J44)

Keywords: board composition, corporate governance, board monitoring, private benefits, ownership structure.

1 Introduction

All recent proposals for governance reform call for a more active monitoring role of boards through increased independence. As evidence that boards have failed to do their work properly, many point to the corporate and accounting scandals at Enron, Tyco and Worldcom. For example, in its report on Enron's collapse, the US Senate argued that by not questioning management about the complicated financial transactions Enron was engaging in, the board had failed in its fiduciary duties to shareholders (US Senate 2002). Others question how boards award executive compensation. Especially in the USA, concerns that Chief Executive Officer (CEO) pay is too high to be compatible with shareholder value

[†] University of Queensland and ECGI. UQ Business School, University of Queensland, Brisbane, Queensland, 4072, Australia.

[‡] London School of Economics, CEPR and ECGI. Department of Finance, Houghton Street, London WC2A 2AE, UK. e-mail: d.ferreira@lse.ac.uk

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maximization are widespread (Bebchuk and Fried 2003). Additional concerns are the size of the pay–performance relation (Jensen and Murphy 1990; Hall and Liebman 1998), contractual puzzles such as the resetting of under-water options and the lack of indexing at the industry level (Hall and Murphy 2003), and more recently the options backdating scandal (Lie 2005). However, there is also a substantial body of research that supports the contrarian view that CEO pay levels have little to do with weak boards (Holmstrom and Kaplan 2003; Frydman and Saks 2007; Gabaix and Landier 2008). Part of the reason for the conflicting views about boards is that there is no robust empirical evidence that board independence improves firm performance (Adams, Hermalin and Weisbach 2009), which is considered a puzzle by many financial economists.¹ Nevertheless, the view that strong boards are desirable is almost never questioned.

One of our goals in this article is to challenge this view. As with almost everything, board independence comes with benefits and costs. Corporate scandals are clear (and expensive) evidence that board monitoring may have been ineffective. Because independent directors are assumed to be better monitors of CEOs, in times of corporate scandals there is a natural tendency to over-emphasize the benefits of board independence and to forget about its costs. We believe that any serious attempt to evaluate the performance of boards should be guided by a theory that takes the benefits of board monitoring, but also its costs, into account.

The model we develop in this article highlights an usually neglected cost of board monitoring: the possibility of breakdowns in communication between CEOs and directors. The special feature of this cost is that it arises endogenously and cannot be easily overcome. As a consequence, since board monitoring is just one of many governance mechanisms, shareholders should rely less on board monitoring whenever communication between CEOs and boards is important. This argument is consistent with recent evidence that tough monitoring by boards may be detrimental to firm performance. Adams and Ferreira (2008) suggest that tough monitoring by boards can reduce firm value in firms that have few anti-takeover provisions. Schmidt (2008) finds that management-friendly boards improve acquisition returns in firms in need of more board advice. Adams (2009a) finds evidence that directors who have a stronger monitoring role perceive that they receive less information from the CEO.

¹ This empirical puzzle has led some to recognize that board independence alone might not be enough to improve governance (Morck 2004).

Consistent with board independence being costly, Ferreira, Ferreira and Raposo (2007) find that board independence is lower in firms in which external governance mechanisms are more effective.

We develop a model in which overmonitoring by the board may lead to a breakdown in communication between the CEO and the board. Recent theoretical papers on boards also emphasize communication between the CEO and the board (Adams and Ferreira 2007). We add to this literature by explicitly analysing the impact of CEO ownership and private benefits on CEOs' incentives to share information with the board. We also derive implications for the optimal amount of board monitoring as a function of CEO ownership and private benefits.

Our model tries to capture important aspects of the special relationship between the CEO and corporate directors. The board monitors the CEO by observing measures of performance, it decides whether to dismiss the CEO, and it also advises the CEO. Advice here is over an investment decision, where the quality of the board's advice is improved if CEO provides it with some firm-specific information.

Directors generally agree that their main responsibility is to hire and fire the CEO (Lorsch and MacIver 1989), thus to fulfil their duty of ensuring the best possible leadership for the firm, directors collect information that helps them evaluate whether the CEO should remain CEO. We define this type of information collection to be the board's monitoring role.

Replacing the CEO, however, is a right that directors seldom exercise. In times of normalcy, directors spend much more time acting as a sounding board for management and advising management on the strategic direction of the firm. Specifically, the board uses the expertise of its members to make recommendations to the CEO. Most board members, however, need to rely on the CEO for firm-specific information. Thus, the quality of the board's advice is improved when the CEO shares its private information with the board.

Given that the board monitors him, a CEO who is uncertain about his ability may face a trade-off in sharing information. On the one hand, the board will give better advice if the CEO shares his information. On the other hand, the additional information may cause the board to revise its previous good opinion of the CEO and fire him. As Lorsch and MacIver (1989, p. 181) point out 'each director is engaged in an ongoing assessment of the CEO's performance, as he or she listens to the chief's report'. Information revealed by the CEO helps the board disentangle the effects of CEO ability on corporate performance from those due to conditions beyond the CEO's control. The more precise the board's information about the CEO's ability, the greater the risk that a CEO whose job is

currently secure faces. Thus, a CEO may hesitate to communicate firm-specific information to a board that monitors him too intensively.²

The predictions of our model can be explored empirically. For example, the model implies a (roughly) U-shaped relation between monitoring and CEO ownership and private benefits, i.e. monitoring decreases then increases with CEO ownership and private benefits. Our theory suggests extensions to prior empirical analyses of these issues. Weisbach (1988) and Shivdasani and Yermack (1999) analyse the cross-sectional relationship between board independence, CEO ownership and CEO tenure. They find that board independence is negatively related to both CEO ownership and tenure. More recent evidence in Boone et al. (2007), Coles, Daniel and Naveen (2008) and Linck, Netter and Yang (2008) suggests that these findings are robust across samples and time periods. This evidence is consistent with CEOs taking an active role in influencing the choice of directors and with more powerful CEOs being able to select a less independent board, as argued, for example, by Hermalin and Weisbach (1998). Our model, however, suggests that previous empirical specifications are not flexible enough to capture more nuanced possibilities.

We predict that board monitoring should be related to CEO ownership and tenure in a non-monotonic fashion. We show that allowing for these non-monotonicities by augmenting previous specifications encountered in the literature generates a different pattern of evidence in a cross-section of firms. In particular, we find that board independence and CEO ownership are negatively correlated when CEO ownership is low, but positively correlated when CEO ownership is sufficiently high. Similarly, we find that board independence and CEO tenure are negatively correlated when CEO tenure is low, but positively correlated when CEO tenure is sufficiently high. While these findings do not necessarily rule out the idea that powerful CEOs select less independent boards, it is not clear how this explanation can generate the non-monotonic relationship that we document.

Our empirical results are fairly robust to changes in specifications and are statistically and economically significant. Furthermore, the results are unchanged when we use a proxy for board monitoring which tries to infer monitoring intensity from the total number of board committee meetings devoted to monitoring, rather than the proportion of outsiders on the board as a measure of board monitoring. Recent literature argues that regulatory definitions of director independence are flawed, because they do not capture social relations between directors and the CEO that may impair a director's judgement in monitoring (Hwang and Kim 2008;

² Our model is related to models in which strong incentives or monitoring intensity lead to 'rationally myopic' behaviours by agents who manipulate or withhold information in detriment of long-run profits. See for example, Stein (1989) or Tirole (2006, ch. 7).

Cohen, Frazzini and Malloy 2009). This new proxy circumvents this problem by focusing on director tasks. Furthermore, this proxy has fewer alternative interpretations than director independence, which has also been used as a proxy for directors' expertise (Coles, Daniel and Naveen 2008; Linck, Netter and Yang 2008). We view the use of this proxy as an additional contribution of this article.

We do not expect our findings to be considered as ultimate evidence corroborating our model. In order to remain tractable, our model abstracts from many important issues, such as the design of optimal CEO compensation and the influence of CEOs on the selection of directors. The evidence is not rich enough to separate every possible effect. Even more problematic, causation cannot be inferred from correlation. However, we believe that the evidence illustrates the importance of theory as a guide for empirical work. Our theory predicts a more complex relationship between board monitoring and CEO ownership and tenure than the ones that have been estimated so far in cross-sectional data. Without such a theory in mind, or another one that generates similar implications, there is no good reason to search for these complex relationships in the data.

Our analysis leads us to question the emphasis put on director independence in the Sarbanes–Oxley Act (SOX) of 2002, the revised listing standards at the New York Stock Exchange (NYSE) and Nasdaq, and the numerous recent governance codes around the world. We believe the problems displayed by banks in the recent financial crisis support our argument that the costs of independence may outweigh its benefits when communication between directors and the CEO is important. The activities of banks are arguably more complex than those of other institutions, which suggests that information exchange between CEOs and directors is essential in order for bank boards to carry out their responsibilities. Furthermore, on average, CEOs of banks have lower ownership than CEOs of non-financial firms, as documented in Adams and Mehran (2003). If we assume that we are in the region of our model where independence is increasing with ownership, this suggests that banks should have lower independence to encourage information-sharing. However, as Adams (2009b) documents, on average, banks actually have higher levels of independence than non-financial firms. One reason may be that regulators demand better compliance with SOX. Adams (2009b) provides further evidence that increased independence may have decreased value for banks. She shows that banks that were bailed out by the US government had more independent boards than other banks. While several explanations are possible, our analysis suggests that excess independence may have lead to communication breakdowns between CEOs and boards. This interpretation is supported by the Organisation for Economic

Co-operation and Development (OECD) Steering Group on Corporate Governance's (Kirkpatrick 2009) argument that bank boards had problems obtaining information.

The remainder of the article is structured as follows. We discuss the related literature in section 2. We develop the theory in section 3 and discuss our empirical evidence in section 4. Section 5 concludes.

2 Related literature

Becht, Bolton and Röell (2002), in their survey of corporate governance, stress the relative scarcity of theoretical analyses of corporate boards, in contrast with other topics in corporate governance, such as takeovers and financial contracting. Since then, there has been a sharp increase in the number of theoretical papers concerned with boards. In this new generation of models, two ideas play a central role. First, it is acknowledged that boards not only monitor management, but that they also have an important advisory role. Second, there is a great emphasis on the problem of communication between the board and the CEO. Here, we briefly review four recent models in this tradition and discuss their relations with our model.

In Adams and Ferreira (2007), we analyse the conflict that arises when a board that has a dual role as a monitor and as an advisor of management needs to extract relevant information from a CEO who dislikes excessive monitoring by the board. We show that it might be optimal for the board to commit to a low level of monitoring intensity in order to provide the CEO with incentives to communicate openly with the board. The model in this article shares these same features, but differs in two important aspects. First, as in previous works on boards, such as Hermalin and Weisbach (1998) and Warther (1998), the need for board monitoring arises from selection rather than moral hazard problems. Second, and most importantly, the model in this article generates predictions concerning the relationship between CEO ownership and board monitoring, which is the main contribution of this article. In Adams and Ferreira (2007), we model CEOs' and shareholders' incentive alignment in a reduced-form fashion, which does not enable us to generate implications for CEO ownership.

Raheja (2005) also emphasizes the role of information transmission between the board and the CEO in a model in which outside directors are less informed than inside directors and the CEO. The distinguishing element in her analysis is her focus on the role of inside directors as providers of information that is useful for monitoring the CEO. Based on an explicit modelling of the motivations and incentives of inside and

outside directors, she derives implications for the optimal size and composition of boards.

Song and Thakor (2006) analyse a problem that is, in many aspects, similar to the one in this article. The main difference is that, in their model, not only the CEO but also directors have career concerns. They show that directors' and CEOs' career concerns interact in important ways, and they generate many interesting implications that are unique to their framework. In particular, the CEO's incentives to disclose high-precision information to the board depend crucially on the career concerns of board members.

Finally, Harris and Raviv (2008) develop a model that combines many of the elements mentioned above. Their distinguishing feature is a focus on the optimal delegation of decision-making between insiders and outsiders, leading to a theory of board control.

The model in this article shares many features with the models discussed above. The distinguishing feature of our model is its ability to generate implications relating CEO ownership, private benefits and board monitoring. Furthermore, we also provide some new evidence corroborating the model.

3 Model

In section 3.1, we describe the setup of the model. In section 3.2, we analyse the model for a fixed monitoring intensity of the board. We relax the assumption that the monitoring intensity is fixed in section 3.3 and analyse the comparative statics of the board's monitoring intensity in section 3.4.

3.1 Setup

3.1.1 *Timing*

Our model has three periods.

3.1.1.1 Period 0. In period 0, the firm is established and shareholders hire a CEO. Shareholders choose the optimal level of monitoring π to evaluate the CEO's ability. They choose a board that will monitor the CEO with intensity π . We interpret the monitoring intensity parameter as a measure of board independence. Alternatively, independence could affect the costs of monitoring as in Adams and Ferreira (2007), leading to the same qualitative conclusion that more independent boards monitor more intensively.

The CEO owns an exogenous fraction w of the firm, as the result of a compensation package to induce unmodelled CEO effort, for example.

3.1.1.2 Period 1. In period 1, the CEO and the board face a non-routine or innovative risky investment decision, such as whether to enter a new product market or not. We assume that this decision is non-routine because on routine issues the board is unlikely to have much of an advisory role. The board observes its own private signal ε about the profitability of the project. The CEO also receives a private signal s about the firm's environment that will help him choose whether or not to undertake the project. This information is uncorrelated with the CEO's ability; for example, the information is about the firm's access to distribution channels or the size of the market. However, a high-ability CEO receives a high-precision signal of firm conditions.³

The CEO then decides whether to reveal his signal to the board or not. After listening to the CEO's report, the board advises the CEO on whether to implement the project or not. We describe the advisory process in more detail subsequently.

At the end of period 1, the CEO chooses whether to implement the project or not.

3.1.1.3 Period 2. At the beginning of period 2, the board investigates (monitors) the quality of the CEO's information by collecting information about the firm's environment with intensity π , and uses this information to update its beliefs about the CEO's ability. Shareholders (and the board) care about managerial ability because CEOs with more precise signals will make better decisions. We assume that project 'output' is not easily observable or, equivalently, that the output can only be verified in the long run, while decisions about the retention of the current CEO must be made before the output becomes fully observable.⁴ On the basis of its evaluation, the board decides whether to fire the CEO and hire a replacement at the beginning of the second period. The CEO loses his private benefits if he is fired, and therefore cares about his job security.

At the end of period 2, the firm is liquidated and all players are compensated out of first-period project revenues and second-period revenues.

3.1.2 Remarks on the main assumptions

3.1.2.1 Sharing information with the board. Before the board advises the CEO, the CEO must decide whether to share his information with the board. Initially, the board believes the ability of the CEO to be high

³ Managerial ability is characterized in a similar way in Scharfstein and Stein (1990) and Prendergast and Stole (1996).

⁴ This assumption can be relaxed. As long as the final output is not completely informative about the CEO's ability, our model would still yield similar qualitative results. See also Ferreira and Rezende (2007).

enough so that it will not fire him unless it obtains information that causes it to change its mind. The CEO is uncertain about his ability, thus any action he takes that allows the board to learn more about his ability imposes a risk on him. Since his job is initially secure, learning by the board can only hurt him. If the board did not monitor him, the CEO would reveal his information since it does not reflect directly on his ability, and with more information the board's advice is improved and the value of the CEO's shareholdings increases. However, when the board monitors him, the CEO's information enables the board to update its prior on the CEO's ability. Thus, the board's posterior on the CEO's ability is more precise when the CEO reveals his information. Since without monitoring the board would not have fired him, the probability that the board fires the CEO increases when the board has a more precise posterior on his ability.⁵ In making his decision, the CEO must weigh the effect his information has on the value of his shareholdings versus on his job security.

The board can verify the CEO's information *ex post*, for example through reports; thus, when the CEO communicates his information to the board, it is always accurate. We also assume that the board cannot induce the CEO to reveal his information by offering him a contract.⁶ This is similar to Aghion and Tirole (1997), where the act of communicating information to the principal is non-contractible. Formally, this is a message game in which the CEO can choose between two messages $\{\emptyset, s\}$, where \emptyset stands for 'not reveal' and s is the CEO's information when he chooses to reveal, but the messages themselves cannot be contracted on.⁷ Due to the limited time they spend in the firm, directors may not be able to evaluate what information they need unless management guides them, especially in the situations in which the board is most likely to have an important advisory role: when the issue at hand is non-routine.⁸ This makes it difficult for them to implement contracts to induce the CEO to reveal his information. One could incorporate this idea formally in our

⁵ This is similar to the argument in Zwiebel (1995): with more information, the variance of the CEO's estimated ability increases, so if the CEO is of high ability getting a bad draw is more likely and will hurt him. If the CEO is of low ability, his chances of getting a good draw increase and he is better off. The difference here is that the manager does not know his actual ability.

⁶ In fact, because his shareholdings increase in value when he reveals, the CEO does get a payoff for revealing. If the board can give him enough shares, the CEO will reveal, as we show later. However, in some cases it may be too costly for the board to induce revelation. This could correspond to a case where the CEO's contract (number of shares) is fixed *ex ante* and new projects arise unexpectedly. It may be too costly to renegotiate the contract whenever this happens.

⁷ Milgrom (1981) provides an early example of such a model.

⁸ See Demb and Neubauer (1992, pp. 116–128) for a discussion of the problem that directors may not know the right questions to ask when the CEO's strategy is not to disclose.

model by making the arrival of the signal stochastic. If the CEO does not always obtain a signal, the board cannot punish the CEO for not revealing information.

3.1.2.2 Advising. A crucial assumption in our analysis is that the quality of board's advice is higher when the CEO shares his private information with the board. There are many reasons why this should be so. For example, the board might have limited time to evaluate competing projects, and CEO's information might be useful in restricting the set of relevant projects that need to be considered (Adams and Ferreira, 2007). Similarly, directors might have to exert costly effort to learn about investment opportunities and the CEO's private information about firm-specific conditions might reduce the board's marginal cost of learning. Finally, it could also be that the combined board expertise ε is too complex to be transmitted in a simple message. Thus, knowledge of the CEO's information might be useful in determining which types of simple messages (a subset of the information contained in ε) the board should send to the CEO.

For our results to hold, it is immaterial which of these cases is assumed. Accordingly, we will simply assume that the quality of the board's advice is higher when the CEO reveals his information. A rationalization of such an assumption can be found in Adams and Ferreira (2007), although in a different setup.

3.1.3 Output technology

The project outcome (if undertaken) at the end of the first period is given by

$$y_1 = \theta + \varepsilon - c, \quad (1)$$

where θ is a parameter reflecting firm-specific conditions, ε is a parameter reflecting the board's expertise concerning industry or economy-wide conditions and c is the (*a priori* known) cost of undertaking the project. If the project is not undertaken, $y_1 = 0$.

To simplify the board's firing strategy, firm revenues at the end of the second period are given by $y_2 = \alpha$, where α is the CEO's ability. The board will dismiss the CEO if expected second-period output under his leadership, $\hat{\alpha}$, is less than expected second-period output, $\bar{\alpha}$, under a replacement CEO, i.e. $\hat{\alpha} < \bar{\alpha}$.

We interpret the project implementation decision as a one-shot strategic decision that has long-term implications. After the firm makes the decision, the board may replace the current CEO with a new one. However, this change can only affect part of the total long-run output, $y = y_1 + y_2$, namely y_2 . We interpret the first component y_1 as the part of the outcome

that is due to the implementation decision only and is not affected by the identity of the CEO in charge.

3.1.4 Information

At the beginning of period 0, neither the board nor the CEO knows the CEO's ability α , the exact firm-specific conditions θ or the general conditions ε . Instead, they have common priors over α , θ and ε . They believe α , θ and ε are independently distributed, with $\alpha = \alpha_H$ with probability q and $\alpha = \alpha_L$ with probability $1 - q$. For simplicity, firm-specific conditions can be either good θ_G or bad θ_B with equal probabilities. The random variable representing the board's expertise concerning industry or economy-wide conditions ε has a cumulative distribution function $F(\cdot)$, which is continuous and has an unbounded domain.⁹ At the end of period 0, the CEO observes a signal $s \in \{\theta_B, \theta_G\}$ of the firm-specific conditions. The signal s equals the true value of θ with probability 1 if the CEO has high ability α_H and with probability $p > 1/2$ if the CEO has low ability α_L . Therefore, better CEOs receive more precise estimates of true firm conditions θ .

Since CEOs do not know their ability, they are not able to signal their ability or can firms sort CEOs *ex ante* by offering a menu of contracts. This is a common assumption in the literature on career concerns initiated by Holmstrom (1982/1999).

3.1.5 Monitoring technology

The board monitors the CEO with probability π , which we call its *monitoring intensity*. Monitoring has two elements. When the board monitors, it may get a direct signal of the CEO's ability α and also a signal of firm conditions θ . It learns the true managerial ability α with probability t and the true firm conditions θ with probability 1. Both signals will be used in updating the board's beliefs about the CEO's ability. For simplicity, we assume that the board does not observe any of the other actions of the CEO, including the decision concerning the project.¹⁰

Initially, the common prior on the CEO's ability is

$$\bar{\alpha} = q\alpha_H + (1 - q)\alpha_L. \quad (2)$$

If the board observes θ but not α , it will update its beliefs about the CEO if and only if it also observes the CEO's signal s . In this case, the CEO's signal matches the board's signal, i.e. $s = \theta$, with probability 1 if the CEO

⁹ These conditions are actually stronger than we need. We make them for simplicity.

¹⁰ This assumption can be relaxed without qualitative changes in the results. As long as the decision concerning project implementation does not fully reveal the CEO's private information, the same trade-off persists if we allow the board to observe the CEO's actions.

is good and probability p if the CEO is bad. Therefore, the unconditional probability of matching signals is $P(s = \theta) \equiv q + (1 - q)p$ and the posterior beliefs on the mean of α are

$$\alpha(s = \theta) = \frac{q}{P(s = \theta)}\alpha_H + \frac{(1 - q)p}{P(s = \theta)}\alpha_L, \quad (3)$$

$$\alpha(s \neq \theta) = \alpha_L.$$

Since the board would not have wanted to fire the CEO at the beginning of the first period, when the CEO's expected ability is $\bar{\alpha}$, the board will not fire the CEO at the beginning of the second period unless it obtains new information through monitoring. We summarize the board's firing strategy formally in the following proposition.

Proposition 1 (Firing Rule): *The board will fire the CEO if and only if:*

1. *It observes the CEO's ability through monitoring (which happens with probability t) and learns that $\alpha = \alpha_L$, or*
2. *It does not observe the CEO's ability directly, but learns that the CEO's signal s does not match its own signal θ , i.e. $s \neq \theta$.*

When the board makes its recommendation concerning project implementation to the CEO, it either knows the CEO's signal s or not. We denote its information at this point by $i \in \{\theta_B, \theta_G, \emptyset\}$. We have that $i = s$ if the board learns the CEO's signal s and $i = \emptyset$ if it does not learn.

Given the board's firing rule, the expected second-period output when the board monitors, $M(i)$, will depend on its information i :

$$M(s) = t[q\alpha_H + (1 - q)\bar{\alpha}] + (1 - t)\{P(s = \theta)\alpha(s = \theta) + [1 - P(s = \theta)]\bar{\alpha}\}, \quad (4)$$

$$M(\emptyset) = t[q\alpha_H + (1 - q)\bar{\alpha}] + (1 - t)\bar{\alpha}.$$

Since

$$M(s) - M(\emptyset) = (1 - t)\{q\alpha_H + (1 - q)p\alpha_L + [(1 - q)(1 - p) - 1]\bar{\alpha}\} > 0, \quad (5)$$

expected second-period output is higher when monitoring is more informed, i.e. when the board learns s . We call the difference $N \equiv M(s) - M(\emptyset)$ the gains from informed monitoring.

3.1.6 Preferences

We will assume that when the board fires him, the CEO retains his shares w .¹¹ In addition, the CEO receives control benefits of b if he remains in

¹¹ It does not alter the analysis much if he loses his shares and it simplifies some of the comparative statics. In fact, managers do receive golden parachutes and if their shares

control at the end of the second period. Thus, the CEO's utility function is given by

$$U_M = w(y_1 + y_2) + b\chi_{\text{Remain in control}}, \quad (6)$$

where

$$\chi_{\text{Remain in control}} = \begin{cases} 1 & \text{if the CEO is not fired} \\ 0 & \text{if the CEO is fired.} \end{cases} \quad (7)$$

Through his share in first-period output the CEO is interested in making a successful project implementation decision. However, he also cares about his job security because if he is fired he may lose his control benefits. In making his decision about whether to reveal, the CEO faces the trade-off that revealing information increases expected output but is also costly because it may increase the probability that he is fired.

The board is risk-neutral. We assume that the board cares only about increasing firm value, $y = y_1 + y_2$. However, the extent to which the board can increase firm value is limited because, in order to analyse the trade-off to the CEO induced by the board's dual role, we assume initially that the board's monitoring intensity π is fixed.

With probability π the board monitors, in which case expected second-period output given its information is $M(i)$. With probability $1 - \pi$ the board does not monitor, in which case it does not fire the CEO. Therefore, the board's expected utility function is given by:

$$EU_B = E[y_1 + \pi M(i) + (1 - \pi)\bar{\alpha}] \quad (8)$$

3.2 Analysis of the model for a fixed monitoring intensity

This section analyses the model when the board's monitoring intensity π is fixed. In section 3.3, we relax this assumption.

At each of its information sets along the equilibrium path the board must behave optimally given its beliefs. It chooses whether or not to recommend project implementation and gathers information on firm-specific conditions with monitoring intensity π . If the board monitors, it observes θ with probability 1 and updates its beliefs about the CEO's ability if it also observes α or if it learns the CEO's signal s . It then decides whether to fire the CEO. The CEO must decide whether or not to reveal his information and whether or not to implement the project given the board's recommendation.

We focus on strategy profiles and belief systems for the board and the CEO that constitute perfect Bayesian equilibria. When the game is in its

are accumulated for their own accounts they cannot be taken away. Only if the manager is given phantom or restricted stock can his stock privileges be revoked.

monitoring phase, the board's optimal behaviour is fully characterized by its firing rule derived in Proposition 1. Therefore, in subsection 3.2.1, we only consider the effects of the players' behaviours on first-period output y_1 . We then work backwards and analyse the CEO's decision to share information in subsection 3.2.2.

3.2.1 Information and the quality of advice

This section describes the advice the board gives to the CEO and the CEO's optimal choice of whether to follow the board's advice or not.

To solve the problem, we start by analysing the continuation games that arise after the CEO's decision to share information is made. There are only two possible types of continuation games at this stage: one in which the board learns the CEO's signal s and one in which it does not.

When the CEO's and the board's strategies constitute an equilibrium, we denote the CEO's expectation of the first-period outcome given his signal s when he reveals his information to the board (i.e. $i = s$) by $E[y_1|s, i = s]$. Similarly, when the CEO does not reveal his information to the board (i.e. $i = \emptyset$), this expectation is $E[y_1|s, i = \emptyset]$. Implicitly, in the definition of these expectations we are assuming Bayesian updating of probabilities along the equilibrium path.

We define the advisory benefits from information sharing as

$$R(s) \equiv E[y_1|s, i = s] - E[y_1|s, i = \emptyset]. \quad (9)$$

Our results depend only on the following weak assumption on the function $R(s)$.

Assumption 1 (Information Sharing Implies Better Advice):

1. The advisory benefits from information sharing are non-negative for all s :

$$R(s) \geq 0;$$

2. At least one of $R(\theta_B)$ and $R(\theta_G)$ is strictly positive:

$$\max\{R(\theta_G), R(\theta_B)\} > 0.$$

The main implications of our model depend only on these two properties of the function $R(s)$. For simplicity, we state them as an assumption, but an explicit modelling of the communication game in which these properties emerge endogenously is available from the authors.

3.2.2 The decision to share information

Here we analyse the first-period decision problem for the CEO. To decide his strategy the CEO compares his expected utilities from revealing and

not revealing his information. The expected utility for the CEO when the board learns his information is given by

$$EU_M(s, i = s) = wE[y_1 | s, i = s] + \pi wM(s) + (1 - \pi)w\bar{\alpha} + b - \pi\{t(1 - q) + (1 - t)[q + (1 - q)(1 - p)]\}b. \quad (10)$$

If the board does not learn s , the CEO's expected utility is given by

$$EU_M(s, i = \emptyset) = wE[y_1 | s, i = \emptyset] + \pi wM(\emptyset) + (1 - \pi)w\bar{\alpha} + b - \pi t(1 - q)b. \quad (11)$$

The monitoring benefits from information sharing are given by $\pi w(M(s) - M(\emptyset)) = \pi wN$. We define the costs from information sharing to be

$$C = \pi(1 - t)[q + (1 - q)(1 - p)]b. \quad (12)$$

It is important to note that the costs from information revealing increase both with the monitoring intensity π and with the private benefits of control b . To simplify notation, we define

$$\kappa \equiv (1 - t)[q + (1 - q)(1 - p)]. \quad (13)$$

We now characterize the equilibrium when the monitoring intensity π is fixed. For simplicity, we assume that when the CEO is indifferent between revealing or not revealing his signal to the board in equilibrium, he will choose to reveal.

Define π' as

$$\pi' \equiv \frac{w \max\{R(\theta_G), R(\theta_B)\}}{\kappa b - wN}. \quad (14)$$

We have the following result:

Proposition 2 (Monitoring Intensity and Information Sharing): *The equilibrium is such that:*

1. if $\kappa b > wN$, and
 - (a) if $\pi \leq \pi'$, the CEO always reveals s ;
 - (b) if $\pi > \pi'$, the CEO never reveals s .
2. If $\kappa b \leq wN$, the CEO always reveals s .

According to this proposition, there exist equilibria in which CEOs will not share information with the board. Since firm value is higher when the CEO does share his information, this proposition provides the motivation for boards who take their fiduciary duties seriously to find instruments with which they can increase the CEO's net gain to sharing information. When it is too costly for a firm's board to affect the CEO's incentives to share information, this proposition explains why the shareholders will change their board in order to find one with which the CEO will communicate.

3.3 Endogenizing the Board's Monitoring Intensity

In the previous section, we argue that when the board's preference for monitoring is fixed, CEOs may not share their information with the board, depending on whether $\pi > \pi'$ or not. Here we discuss the equilibria that arise when the board commits to a choice of monitoring intensity *ex ante* in order to maximize shareholder value. We assume that it costs the board $d(\pi)$ to change its monitoring intensity π .¹² We assume $d(0) = 0, d' > 0, d'' > 0, \lim_{\pi \rightarrow 0} d'(\pi) = 0, \lim_{\pi \rightarrow 1} d'(\pi) = \infty$.

For the sake of brevity, we assume from now on that $\kappa b > wN$, so that only part 1 of Proposition 2 is relevant. If this assumption does not hold, the problem is still well defined. However, the monitoring benefits from information sharing would always be larger than the costs from information sharing, implying that the CEO faces no trade-off between revealing and not revealing. We therefore focus on the more interesting case in which this trade-off is present, which is more likely to occur when private benefits of control b are high and CEO ownership w are low.

Let $m(s, \pi)$ be the message the CEO sends to the board when his private information is s and the monitoring intensity is π . From proposition 2, we have that

$$m(s, \pi) = \begin{cases} s, & \text{if } \pi \leq \pi' \\ \emptyset, & \text{if } \pi > \pi'. \end{cases} \quad (15)$$

Messages affect first-period outcomes through their effect on the quality of the advice the board can offer to the CEO:

$$E[y_1 | m(s, \pi)] = \begin{cases} \frac{1}{2}E[y_1 | s = \theta_G, i = s] + \frac{1}{2}E[y_1 | s = \theta_B, i = s], & \text{if } m(s, \pi) = s \\ \frac{1}{2}E[y_1 | s = \theta_G, i = \emptyset] + \frac{1}{2}E[y_1 | s = \theta_B, i = \emptyset], & \text{if } m(s, \pi) = \emptyset. \end{cases} \quad (16)$$

Messages affect second-period outcomes through their effect on the quality of the board's monitoring $M[m(s, \pi)]$.

The board's problem can then be written as

$$\max_{\pi} E[y_1 | m(s, \pi)] + \pi M[m(s, \pi)] + (1 - \pi)\bar{\alpha} - d(\pi) \quad (17)$$

The next proposition describes the main properties of the equilibrium.

Proposition 3 (Optimal Choice of Monitoring): *The equilibrium is always unique (with respect to the choice of π) and it is of one of the following three types:*

1. *The optimal monitoring intensity π^* is $\pi^f < \pi'$ and the CEO shares his information $m(s, \pi^*) = s$. Furthermore, the board chooses the first-best*

¹² For example, this could be a result of coordination costs (Yermack 1996).

level of monitoring and both first- and second-period outputs are at their first-best levels.

2. The optimal monitoring intensity π^* is π' and the CEO shares his information $m(s, \pi^*) = s$. Although the first-best level of outcome is achieved in period one, the same is not true for the second-period outcome, since there is too little monitoring.
3. The optimal monitoring intensity π^* is $\pi^n > \pi'$ and the CEO does not share his information $m(s, \pi^*) = \emptyset$. Neither the first- nor the second-period outputs are at their first-best levels.

In the first equilibrium, the CEO's revelation constraint is not binding. In the second equilibrium, the CEO's revelation constraint is binding but the value of the CEO's information is high enough that the board will optimally commit to a smaller monitoring intensity than the first-best level to induce the CEO to reveal it.¹³ In the third equilibrium, the CEO's revelation constraint is binding but it is too costly to induce the CEO to reveal. Since, the board's preferred monitoring intensity is highest when there is full communication (since the option value of firing the CEO is highest when he reveals), we define the board's preference for less than first-best monitoring to be management friendliness.

3.4 Comparative statics on the board's monitoring intensity

Here we discuss the results linking cross-sectional differences in monitoring intensity π to CEO's shareholdings and his private benefits

As CEO ownership increases, his net gain to revealing his information increases. Thus, the optimal monitoring intensity in a sample of firms differing in the amount of CEO ownership will vary non-monotonically as follows:

Proposition 4 (Relation between equilibrium monitoring and CEO ownership): *There exist levels of CEO ownership w^f and w^n where $0 < w^n < w^f$ such that:*

1. *the monitoring intensity of the board is at its first-best level π^f if CEO ownership is greater than w^f ;*

¹³ The argument that in certain situations too much information may hurt the principal has been studied in other contexts. For example, Aghion and Tirole (1997) discuss how a principal may choose to delegate formal authority to an agent when the agent's private benefits are high or when the principal cannot refrain from hurting the agent. With more formal authority, the agent will participate more in the organization (e.g. communicate information). Similarly, Burkart, Gromb and Panunzi (1997) consider the trade-off between more initiative by management and more control through monitoring by shareholders.

2. *the optimal monitoring intensity of the board is $\pi^* = \pi'$ if CEO ownership is between w^f and w^n ;*
3. *the optimal monitoring intensity of the board is $\pi^* = \pi^n$ if CEO ownership is below w^n .*

The optimal monitoring intensity is a non-monotonic function of w . When w is very low, boards monitor with intensity π^n . Beyond w^n , monitoring initially drops then rises again. At w^n there is a discrete jump in the board's monitoring intensity due to the fact that the CEO makes a discrete choice to reveal or not.

As the CEO's concern about being fired increases, he is less likely to reveal his information. Thus as b increases, it will become more costly to induce him to reveal. Since firm value is independent of the CEO's private benefits b , the analysis of the optimal monitoring intensity as a function of b is similar to the analysis for ownership. As a function of his private benefits, optimal monitoring varies non-monotonically as follows:

Proposition 5 (Relation between equilibrium monitoring and CEO private benefits): *There exist levels of private control benefits b^f and b^n where $0 < b^f < b^n$ such that:*

1. *the monitoring intensity of the board is at the first-best level π^f if private benefits are less than b^f ;*
2. *the optimal monitoring intensity of the board is $\pi^* = \pi'$ if private benefits are between b^f and b^n ;*
3. *the optimal monitoring intensity of the board is $\pi^* = \pi^n$ if private benefits are above b^n .*

As is the case for ownership, the optimal monitoring intensity is a non-monotonic function of b . When b is low, boards monitor with the first-best intensity π^f . Beyond b^f , monitoring decreases and then jumps up again to π^n .

4 Testable implications and some evidence

The model implies a (roughly) U-shaped relation between board monitoring and both CEO ownership and private benefits, i.e. monitoring decreases and then increases with these characteristics of the CEO's incentive structure. Thus, while it would be difficult to test the model's implications concerning the extent to which CEOs share information with their boards,¹⁴ the implied cross-sectional relationships between monitoring

¹⁴ Although see Adams (2009a) and Schmidt (2008) for some recent steps in this direction.

and both incentive alignment and private benefits can, in principle, be examined empirically. Using a cross-section of 358 Fortune 500 firms in fiscal 1998, we conduct a brief examination to determine whether the evidence appears consistent with the predictions of the model.

The key step to implementing the empirical examination is to develop appropriate proxies for the board's monitoring intensity. The proxies for the CEO's ownership and private benefits are more straightforward.

Proxies for the board's monitoring intensity: in accordance with the traditional assumption that board composition determines the board's monitoring strength, we reinterpret the probability that the board monitors the CEO as a fixed parameter representing the percentage of outside directors on the board (Baysinger and Butler 1985; Hermalin and Weisbach, 2003). This proxy has been criticized for not taking into account social relations between directors and the CEO (Hwang and Kim 2008; Cohen, Frazzini and Malloy 2009). Furthermore, it may also be flawed if inside directors have information that allows them to be more effective monitors.

We also use a different proxy for the board's monitoring intensity than previously used. In particular, we attempt to measure the monitoring intensity of the board independently of its advisory function by using a proxy developed in Adams (2003). We use board committee descriptions as a way of separating the board's monitoring from its non-monitoring tasks. Then we construct a proxy for the probability that the board monitors the CEO by using committee size and meeting data to estimate the proportion of director meetings allocated to monitoring duties. This proxy combines the idea that activity (the number of meetings) matters for monitoring as well as the number of directors who are monitoring.¹⁵

Since this proxy is based on board activity and size, it is independent of board composition. Boards and committees either have regular or special meetings. However, special meetings are rare.¹⁶ Thus, it is plausible that directors can commit to a given monitoring intensity through their scheduling of board and committee meetings. One advantage of this proxy is that it avoids the problem pointed out in recent literature that regulatory definitions of director independence are flawed because they do not capture social relations between directors and the CEO (Hwang and Kim 2008; Cohen, Frazzini and Malloy 2009). Another advantage is that it has fewer alternative interpretations than independence, which can also

¹⁵ The assumption that the number of directors matters for monitoring is similar to the assumption in the literature that uses the supervisor/worker ratio to test efficiency wage theories (see Prendergast 1999, for a summary).

¹⁶ Only 5.5% of the sample firms had special board meetings. Only 4% of the 1561 board committees in the sample firms had special meetings.

proxy for the extent to which the board has firm-specific knowledge, as in Coles, Daniel and Naveen (2008).

Proxies for CEO ownership and private benefits: We proxy the extent to which CEOs care about increasing firm value by their shareholdings. Since in the model the CEO cares about his job security due to fear of losing his private benefits, it is reasonable to assume that the longer the CEO has been in the firm the smaller are his private benefits (because there are fewer periods remaining until retirement). Thus, consistent with Gibbons and Murphy (1992) and Brickley, Coles and Linck (1999), we use a measure of CEO tenure to proxy for the CEO's internal career concerns.

We also use a dummy variable indicating whether the CEO is also the chairman of the board as a measure of his private benefits. Many firms (Vancil 1987) have a well-defined succession process that can be described as follows: the president, (or other heir apparent to the CEO) becomes CEO and president. After a probationary period he receives the additional title of chairman. As part of his succession process he relinquishes first the title of president, then the title of CEO, and finally the title of chairman. Once the CEO becomes chairman he has no further title to aspire to, so his concerns about job security are likely to be smaller than before. In addition, he is more likely to be closer to the end of his career than the beginning. Thus, we expect to observe a positive relation between the CEO = chair dummy and the monitoring intensity of the board.

4.1 Data sources and description

For all publicly traded Fortune 500 companies in 1998 for which we could obtain proxy statements or 10-Ks from Disclosure Global Access, we collected data on board and CEO characteristics during fiscal year 1998. We exclude financial firms and utilities. Our final sample consists of 358 firms.

For each firm we collected the following information about its board: the proportion of insiders, board size, number of meetings, the number and types of committees, and the size and number of meetings of each committee during fiscal year 1998. For six of the firms we could only obtain 10-Ks that do not disclose committee information. Thus, our final sample of committees contains 1565 committees from 352 firms. In addition, we collected the number of years the CEO has been on the board and the proportion of shares the CEO holds in the firm.¹⁷ Financial data

¹⁷ We define the CEO's shareholdings to be the sum of common shares, deferred shares, restricted shares and shares held for family members minus options exercisable within 60 days.

are from Compustat. Data on the number of years since the date of incorporation are from Moody's Manuals.

Since proxy statements only selectively disclose the year the CEO joined the firm, we use the number of years the CEO has been on the board as a proxy for the CEO's tenure in the firm. We define the proportion of outsiders on the board to be the proportion of directors who do not work for the firm.

We construct our second proxy for the board's monitoring intensity as follows: we define meeting units spent on the work of a committee to be the number of directors on the committee times the number of regular meetings of that committee during fiscal year 1998. The number of meeting units spent on monitoring duties is the sum of meeting units devoted to the compensation, audit, corporate governance, nominating, non-managing director, succession and stock option committees. Total meeting units are the sum of total meeting units spent on committee work and the meeting units spent on board work (equals board size times number of regular board meetings). A proxy for the board's monitoring intensity is then the fraction of total meeting units spent monitoring (for more information see Adams 2003).

Table 1 shows descriptive statistics for selected financial and board characteristics. The correlation between the fraction of outsiders and the fraction of total meeting units spent monitoring is 0.24, thus the dependent variables seem to be sufficiently different to warrant using both.

4.2 Empirical results

Several empirical papers have already found a negative relationship between both top management ownership and tenure and the proportion of outsiders on the board (Shivdasani and Yermack 1999). To capture the non-monotonicity predicted by our model we add quadratic terms of ownership and tenure to similar regressions. In addition, we include the CEO = chairman dummy. To be consistent with the roughly U-shaped relations predicted by our model, we expect to find that the coefficients on these additional terms are positive.

As firm-level controls we include the natural log of book value of assets as a measure of size, capital expenditures over sales as a measure of growth, the number of two-digit Standard Industrial Classification (SIC) segments the firm operates in as a measure of diversification, the number of years since the date of incorporation as a measure of age, return on assets as a measure of performance and leverage (long-term debt/book value of assets). In addition, all specifications include two-digit SIC industry dummies.

Table 2 presents the coefficient estimates for all specifications using board composition as the dependent variable. White's robust *t*-statistics

Table 1 Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Book value of assets (\$ million)	354	12 607	28 411	717	355 935
Capital expenditures over sales	346	0.07	0.06	0	0.34
Number of segments	357	2.9	1.9	1	9
Return on assets	349	0.15	0.07	-0.19	0.41
Firm age	356	54.9	35.5	0	146
Leverage	348	0.23	0.15	0	0.93
CEO = COB indicator	357	0.77	0.42	0	1
CEO tenure as director (years)	358	10.3	8.9	0	49
CEO ownership (%)	357	1.8	5.6	0	46.5
Board size	358	11.3	2.8	4	22
Number of committees	352	4.4	1.4	1	10
Fraction of outside directors	358	0.79	0.12	0.25	0.94
Total director meeting units	349	153.5	67.9	25	416
Fraction of total meeting units spent on committee work	349	0.41	0.13	0.04	0.72
Fraction of total meeting units spent monitoring	349	0.31	0.10	0.04	0.61

The sample consists of data on all non-financial, non-utility firms on the 1999 Fortune 500 list, for which proxy statements could be obtained. Data are for fiscal year 1998. Financial data are from Compustat. The number of business segments is equal to the number of two-digit SIC codes segments the firm operates in. Leverage = long-term debt/book assets. Data on year of incorporation were taken from Moody's Manuals. Governance characteristics were collected from proxy statements for the 1999 proxy season. These proxies contain data on governance characteristics during fiscal year 1998. CEO = COB is a dummy indicating whether the CEO is the chairman of the board (yes = 1). CEO tenure as director is the number of years the CEO has been on the board. CEO ownership is total cash flow rights in units of the company's traded common stock not counting options exercisable within 60 days. Some CEOs only hold shares in a different class of stock; those CEOs have zero common shareholdings. Board size is the number of directors sitting on the board at the beginning of fiscal year 1998, which we calculate as the number of directors standing for election in 1999, plus the number that left the board, minus the number that was added during the year. The board size variable excludes advisory directors and director emeriti. We define outsiders to be all directors except those currently employed by the company. The estimate of number of director meeting units spent on the work of a committee is the number of directors on the committee times the number of regular meetings of that committee during fiscal year 1998. Total meeting units spent on committee work are the sum of all meeting units spent on individual committees. Total meeting units are the sum of total meeting units spent on committee work and the meeting units spent on board work (equals board size times number of regular board meetings). We define the number of meeting units devoted to monitoring duties to be the sum of meeting units devoted to the compensation, audit, corporate governance, nominating, non-managing director, succession, and stock option committees. The number of observations varies because of missing data.

Table 2 OLS regressions of the fraction of outside directors on firm characteristics

	I	II	III	IV	IV
CEO = COB indicator	0.060*** [3.50]	0.069*** [4.00]	0.065*** [3.67]	0.065*** [3.86]	0.075*** [4.37]
CEO tenure as director	-0.026*** [3.44]	-0.053*** [2.40]	-0.058** [2.58]	-0.024*** [3.10]	-0.060*** [2.70]
CEO tenure as director squared		0.008 [1.39]	0.009 [1.44]		0.010* [1.68]
CEO ownership	-0.247 [1.55]	-1.089** [2.38]	-0.271* [1.74]	-1.082** [2.40]	-1.113** [2.43]
CEO ownership squared		2.453** [2.25]		2.499** [2.29]	2.563** [2.34]
Ln (book value of assets)	0.002 [0.29]	0.006 [0.72]	0.004 [0.51]	0.004 [0.52]	-0.001 [0.12]
Capital expenditures over sales	0.073 [0.67]	0.040 [0.37]	0.072 [0.67]	0.041 [0.37]	0.019 [0.18]
Number of segments	-0.005 [0.98]	-0.006 [1.35]	-0.005 [1.08]	-0.006 [1.25]	-0.006 [1.28]
Return on assets	0.081 [0.83]	0.079 [0.79]	0.092 [0.95]	0.069 [0.69]	0.067 [0.66]
Firm age	0.006*** [2.78]	0.005** [2.50]	0.006*** [2.70]	0.005** [2.58]	0.004* [1.81]
Leverage	-0.042 [0.61]	-0.052 [0.77]	-0.051 [0.75]	-0.044 [0.64]	-0.063 [0.91]
Board size					0.004* [1.67]
Number of committees					0.008* [1.78]
Observations	332	332	332	332	329
R ²	0.314	0.34	0.32	0.334	0.356

The sample is a cross-section of 358 Fortune 500 firms in fiscal year 1998. The dependent variable is the fraction of directors who do not work for the company as a proxy for the board's monitoring intensity. CEO = COB is a dummy indicating whether the CEO is the chairman of the board (yes = 1) as a proxy for CEO career concerns. Likewise, CEO tenure as director (equals number of years the CEO has been on the board) is a proxy for CEO tenure in the firm and therefore a proxy for CEO career concerns. CEO tenure is measured in decades. CEO ownership is a proxy for the CEO's incentive alignment. CEO ownership is measured as a fraction of total shares outstanding. Firm age is measured in decades. All regressions include dummy variables for two-digit SIC codes. Absolute values of robust *t*-statistics are in brackets. Asterisks indicate significance at 0.01 (***), 0.05 (**), and 0.10 (*) levels.

are in parentheses to correct for potential heteroskedasticity. To compare with the previous literature, column I of Table 2 shows the results of the OLS regression without the quadratic terms for CEO tenure and ownership. The signs, magnitudes and pattern of significance of the estimated coefficients on CEO tenure, ownership and the CEO = chairman dummy are very similar to the estimates in a cross-section of 336 Fortune 500 firms in Shivdasani and Yermack (1999, Table IV, first column).¹⁸

In column II, we add the quadratic terms for CEO tenure and ownership. Consistent with the implications of the model, the coefficients on both quadratic terms and the coefficient on the CEO = chairman dummy are positive, with the coefficient on the square of ownership significant at the 5% level and the CEO = chairman dummy significant at the 1% level. Once we include the quadratic term, ownership also becomes significant (at the 5% level) unlike in column I, suggesting that the quadratic term was an omitted variable in column I. In columns III and IV, we include the quadratic terms for tenure and ownership separately with similar results. In column V, we replicate column II with board size and number of committees as additional board level controls as in Shivdasani and Yermack (1999). All relevant explanatory variables are significant with the predicted signs in this specification.

In Table 3, we present the results using the fraction of total meeting units devoted to monitoring as a proxy for the board's monitoring intensity. Overall, the results are similar to those in Table 2, yet suggest even more strongly than the results in Table 2 that the relationship between the monitoring intensity by the board and both CEO tenure and ownership is non-linear as implied by the model.

The estimated effects also appear to be economically significant. For example, if the CEO is not the chairman of the board, the board's monitoring intensity is reduced by 0.06–0.08 (0.04–0.05) when the dependent variable is the fraction of outsiders (the fraction of meeting units devoted to monitoring) compared to when the CEO is the chairman of the board. This represents a reduction of approximately one-half of the standard deviation in the board's monitoring intensity.

If we focus on our new measure of monitoring (Table 3), we find that the non-monotonic effects are also economically meaningful. Our results suggest that monitoring decreases with tenure in the first 2 years and increases with tenure after 3 years. It is interesting to note that it usually takes 2 years for the CEO to become the chair of the board. Monitoring also decreases with CEO ownership until 19%, when it starts to increase

¹⁸ Shivdasani and Yermack (1999) use a non-CEO chairman of the board dummy, so the sign on the CEO = chairman dummy is the opposite of the estimated coefficient in their paper.

Table 3 OLS regressions of the fraction of total meeting units devoted to monitoring on firm characteristics

	I	II	III	IV
CEO = COB indicator	0.039*** [2.65]	0.050*** [3.40]	0.046*** [3.09]	0.043*** [2.99]
CEO tenure as director	-0.013 [1.56]	-0.054*** [2.72]	-0.058*** [2.98]	-0.010 [1.27]
CEO tenure as director squared		0.013** [2.52]	0.013*** [2.64]	
CEO ownership	-0.058 [0.35]	-0.770** [2.23]	-0.093 [0.59]	-0.760** [2.18]
CEO ownership squared		2.029** [2.02]		2.097** [1.99]
Ln (book value of assets)	0.011 [1.36]	0.015** [2.01]	0.014* [1.74]	0.013 [1.63]
Capital expenditures over sales	-0.360*** [2.69]	-0.389*** [2.83]	-0.362*** [2.70]	-0.388*** [2.83]
Number of segments	0.002 [0.37]	-0.001 [0.03]	0.001 [0.19]	0.001 [0.15]
Return on assets	0.155 [1.49]	0.159 [1.53]	0.171* [1.66]	0.143 [1.37]
Firm age	0.001 [0.29]	-0.001 [0.11]	0.001 [0.14]	0.001 [0.04]
Leverage	-0.068 [1.16]	-0.082 [1.43]	-0.082 [1.41]	-0.069 [1.20]
Observations	327	327	327	327
R ²	0.236	0.269	0.252	0.254

The sample is a cross-section of 358 Fortune 500 firms in fiscal year 1998. The dependent variable, the fraction of total meeting units devoted to monitoring, is a proxy for the board's monitoring intensity. We define meeting units spent on monitoring duties to be the sum of meeting units devoted to compensation, audit, corporate governance, nominating, non-managing director, succession, and stock option committees. Meeting units spent on a committee is the number of directors on the committee times the number of regular meetings of that committee during fiscal year 1998. Total meeting units are the sum of total meeting units spent on committee work and the meeting units spent on board work (equals board size times number of regular board meetings). CEO = COB is a dummy indicating whether the CEO is the chairman of the board (yes = 1) as a proxy for CEO career concerns. Likewise, CEO tenure as director (equals number of years the CEO has been on the board) is a proxy for CEO tenure in the firm and therefore a proxy for CEO career concerns. CEO tenure is measured in decades. CEO ownership is a proxy for the CEO's incentive alignment. CEO ownership is measured as a fraction of total shares outstanding. Firm age is measured in decades. All regressions include dummy variables for two-digit SIC codes. Absolute values of robust *t*-statistics are in brackets. Asterisks indicate significance at 0.01 (***) and 0.10 (*) levels.

with ownership. Note that, according to our model, monitoring should only increase with ownership when the CEO becomes fully aligned with shareholders (concerning the information-sharing decision).

Although potential endogeneity problems weaken the interpretation of the evidence, we conclude that the raw evidence is at least not inconsistent with the empirically testable implications of the model. In addition, while the results could also be consistent with other explanations, we are unaware of other theories predicting a non-monotonic relationship between board monitoring and CEO career concerns and ownership. For example, the results do not appear consistent with traditional agency stories which predict that CEO power (or entrenchment) is negatively associated with monitoring by the board. In such a case, one might expect that when the CEO is the chairman of the board, monitoring by the board decreases. In contrast, we find that when the CEO takes on both roles, monitoring by the board increases. In addition, the entrenchment hypothesis implies that monitoring by the board should decline over the course of the CEO's tenure (Hermalin and Weisbach 1998). The increase in monitoring close to a CEO's retirement here is inconsistent with this prediction.

5 Conclusion

Explicit theories of boards are useful, mostly because they can suggest new ways of looking at the data. Our model has new empirical implications. Although our evidence in this article is only suggestive, it does raise some questions concerning the interpretation of previous empirical findings. A superficial glance at the empirical evidence may sometimes suggest that boards are structured in ways that are not consistent with shareholder value maximization. Our preliminary evidence in this article suggests more caution in drawing inferences from data: there are some cross-sectional relationships between board monitoring, CEO ownership and CEO tenure that defy explanations based on CEO power alone. Much more empirical work is needed to assess the importance of CEO power for the design of governance structures. This is especially important because governance reform has been and will continue to be an important priority for policy makers.

We believe that recent governance reform proposals may have overemphasized the idea that independence serves to limit CEO power. Our analysis suggests that the value of independence depends on other incentive mechanisms in place. Furthermore, the value of independence is not monotonic. Thus, simply mandating an increase in independence for all firms is not the solution to governance problems in all firms. Furthermore, focusing primarily on one incentive mechanism may cause additional governance problems. Our analysis suggests, for example, that firms

may respond to increases in independence by increasing CEO ownership. But, increases in ownership may lead to potentially excessive risk-taking by CEOs. The recent concern about bank governance during the financial crisis illustrates that SOX and the NYSE and Nasdaq listing standards may not have been effective in solving governance problems. Several observers identify excessive director independence as a problem. In addition, many argue that bank executives received too much performance pay which led them to undertake strategies that were too risky. As a result, the OECD has launched an action plan to address weaknesses in corporate governance. Some aspects of this plan seem like steps in the right direction; for example, it emphasizes more than one incentive mechanism for CEOs. However, unless the interactions between incentive mechanisms are taken into account, it is unlikely to solve all the problems it hopes to address.

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6 Appendix

6.1 Proofs

Proof. (Proposition 1) Since $P(s = \theta) = q + (1 - q)p < 1$, $\frac{q}{P(s=\theta)} > q$ (and $\frac{(1-q)p}{P(s=\theta)} = 1 - \frac{q}{P(s=\theta)} < 1 - q$). Therefore,

$$\alpha(s = \theta) = \frac{q}{P(s = \theta)}\alpha_H + \frac{(1 - q)p}{P(s = \theta)}\alpha_L$$

gives more weight to α_H than $\bar{\alpha}$ does, which implies that $\alpha(s = \theta) > \bar{\alpha} > \alpha(s \neq \theta) = \alpha_L$. Therefore, the board will retain the CEO if and only if it learns that he is of high ability or the CEO's signal matches its own signal, i.e. $s = \theta$. ■

Proof. (Proposition 2) Assume $\kappa b > wN$. Let $\pi \leq \pi'$ and let $s' \in \arg \max R(s)$. By Assumption 1, we know that $R(s') > 0$. A CEO who receives a signal s' chooses to reveal his information if (assuming that the board assigns equal probabilities to both types whenever the CEO does not reveal his information):

$$wR(s') \geq \pi(\kappa b - wN).$$

But this condition holds in this case from $\pi \leq \pi'$. Therefore, the CEO will reveal his information if $s = s'$. Consider now a CEO of type $s'' \neq s'$ and suppose that he chooses not to reveal his signal. The board, however, knowing that if the CEO had a signal s' he would have chosen to reveal, correctly infers that $s = s''$. This makes the CEO indifferent between revealing or not revealing his information when $s = s''$. Since we assume that ties are broken in favour of revealing, we conclude that the CEO will choose to reveal his information when $s = s''$ as well.

Now let $\pi > \pi'$. In this case, both types of CEOs (θ_G or θ_B) prefer not to reveal their information, so this is an equilibrium.¹⁹

¹⁹ There may exist other perfect Bayesian equilibria in this case, ones in which both types reveal their information, and when a deviation occurs and the CEO does not reveal his type, the board believes that one of the types (either θ_B or θ_G) is more likely to be the one deviating, and assigns different probabilities to each type after a deviation. We argue that these equilibria are unreasonable, for they require that the CEO's 'right to remain silent' signals his information even though both types have incentives not to reveal. This case is analogous to the right-to-silence game analysed in Farrell and Rabin (1996). Instead of remaining silent, the CEO could say 'you should not try to infer my information from the fact that I am not talking to you, because it is in my own interest not to reveal my information to you no matter what it is'. This message, if believed, is credible. Assuming a rich common language (Farrell 1993), these equilibria should be ruled out because they are not neologism-proof.

If $\kappa b \leq wN$, then pooling (non-revealing) equilibria do not exist, because the expected gain from revealing when your type is θ_s is

$$wR(s) + \pi(wN - \kappa b) \geq 0$$

with strict inequality for at least one of the types. If both types reveal their information, this is trivially an equilibrium. ■

Proof. (Proposition 3) Let π^f be such that

$$M(s) - \bar{\alpha} = d(\pi^f).$$

π^f is well-defined because $M(s) - \bar{\alpha} > 0$ and we assumed that $d(\cdot)$ satisfies certain regularity conditions.

Suppose first that $\pi^f \leq \pi'$. If the board chooses $\pi^* = \pi^f$, then by Proposition 2 the CEO will choose to share his information. When there is information sharing, advising is optimal and expected first-period output is therefore maximized. But since π^f is the unconstrained best choice of monitoring for the board, second-period output (which depends only on monitoring) is at its first-best level. This is the equilibrium in item 1.

Suppose now that $\pi^f > \pi'$. Now, the first-best cannot be achieved anymore. If the board wants to induce revelation, it will choose $\pi^* = \pi'$. Otherwise, it will choose $\pi^* = \pi^n$ where π^n is such that

$$M(\emptyset) - \bar{\alpha} = d(\pi^n).$$

π^n is well-defined because $M(\emptyset) - \bar{\alpha} > 0$. The board will prefer choosing $\pi^* = \pi'$ if

$$\begin{aligned} & E[y_1 | m = s] + \pi' M(s) + (1 - \pi') \bar{\alpha} - d(\pi') \\ & \geq E[y_1 | m = \emptyset] + \pi^n M(\emptyset) + (1 - \pi^n) \bar{\alpha} - d(\pi^n) \end{aligned}$$

and will choose $\pi^* = \pi^n$ otherwise. If it chooses $\pi^* = \pi'$, Proposition 2 implies that the CEO will share his information $m(s, \pi^*) = s$. First-period output is maximized because the board learns the CEO's information, but second-period output is not first-best because there is too little monitoring: $\pi^* < \pi^f$. This is the equilibrium in item 2.

If the board chooses $\pi^* = \pi^n$, Proposition 2 implies that the CEO will not share his information $m(s, \pi^*) = \emptyset$. Expected first-period output is not maximized because the board does not learn the CEO's information; second-period output is also not first-best because the gains from monitoring are lower when there is no information sharing: $M(\emptyset) < M(s)$. This is the equilibrium in item 3. ■

Proof. (Proposition 4) Since $\pi'(w)$ is a strictly increasing function of w , $\pi'(0) = 0$ and π^f does not depend on w , there exists a unique w^f such that $\pi'(w^f) = \pi^f$. Since for all $w \geq w^f$, $\pi'(w) \geq \pi^f$ the board will implement the

first-best level of monitoring by choosing to monitor with intensity π^f in this region by Proposition 3. For all $w < w^f$, the first-best cannot be implemented anymore. Now consider the board's expected utility when $\pi = \pi'$ and the CEO reveals. The derivative of the board's expected utility with respect to w is:

$$\frac{\partial EU_B}{\partial w} = [M(s) - \bar{\alpha} - d'(\pi')] \frac{\partial \pi'}{\partial w}.$$

Since π^f was chosen to satisfy $M(s) - \bar{\alpha} - d'(\pi^f) = 0$ and $d'(\pi) > 0$, we have for all $w < w^f$ that $M(s) - \bar{\alpha} - d'(\pi') > 0$. Since $\partial \pi' / \partial w > 0$, the board's expected utility is strictly increasing in w . Since the board's expected utility when the CEO does not reveal is independent of w , there exists a unique $w^n < w^f$, such that for all $w^f \geq w \geq w^n$ the board chooses to induce revelation by monitoring with intensity π' and for all $w < w^n$ the board chooses to monitor with intensity π^n .²⁰ Now suppose that $w = \hat{w}$ is such that $\pi^n = \pi'$. In this case, the board's expected utility is strictly greater when the CEO reveals, therefore $\hat{w} > w^n$ and there is a discontinuity in the board's strategy since at w^n , $\pi^n > \pi'$. ■

Proof. (Proposition 5) The proof is analogous to the proof for the CEO's shareholdings except that $\pi'(b)$ is strictly decreasing in b and $\lim_{b \rightarrow wN/\kappa^+} \pi'(b) = \infty$, so there exists a unique b^f such that $\pi'(b^f) = \pi^f$ and the board can implement the first-best monitoring probability π^f for all $b \leq b^f$. Since for all $b > b^f$, $M(s) - \bar{\alpha} - d'(\pi') > 0$ but $\partial \pi' / \partial b < 0$, the board's expected utility is strictly decreasing in b in this region. Since the board's expected utility when the manager does not reveal is independent of b , there exists a unique $b^n > b^f$, such that for all $b^f \leq b \leq b^n$ the board chooses to induce revelation by monitoring with intensity π' and for all $b > b^n$ the board chooses to monitor with intensity π^n . Now suppose that $b = \hat{b}$ is such that $\pi^n = \pi'$. In this case, the board's expected utility is strictly greater when the manager reveals, therefore $\hat{b} < b^n$ and there is a discontinuity in the board's strategy since at b^n , $\pi^n > \pi'$. ■

²⁰ We are assuming here that when $w = 0$ and the board chooses to induce revelation by monitoring at intensity $\pi' = 0$, the board's expected utility is smaller than when the CEO does not reveal and the board monitors at π^n . If not, $w^n > 0$ does not exist but the remainder of the proposition still holds.