Say on Pay and the “Quiet Life” of Boards*

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Abstract

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The rapid rise in CEO pay over the past decades has fueled an intensive debate on corporate governance. Fiduciary duty rules are supposed to safeguard shareholders’ interests when boards design compensation packages for managers. However the so-called “managerial power view” holds that boards may be colluding with CEOs to transfer wealth from shareholders. In response, recent regulatory initiatives such as “Say on Pay” and the Dodd-Frank Act aim to reinvigorate fiduciary duty rules and to put shareholders back in control. I develop a model in which a self-interested board contracts with a CEO in a setting that combines agency frictions and strategic communication. The board can learn about the firm’s environment through monitoring and/or communication. In equilibrium the board has an excessive preference for communication. As a result, the board grants the CEO a greater equity stake than as preferred by the shareholders. While this may seem consistent with the managerial power view, it is in fact more a manifestation of the board pursuing a “quiet life”, because the greater CEO equity stake promotes CEO-board communication, and thereby reduces the pressure for the board to engage in costly monitoring. By adjusting the board’s equity stake, the shareholders can actively preempt such behavior, though they may not always choose to do so. Ironically, I find that precisely for those cases where the board successfully subverts the shareholders’ intent, the board is ultimately worse off from having discretion. This illustrates the importance of taking boards as strategic, self-interested players, rather than assuming they align themselves fully with either shareholders or management.
1 Introduction

The task of designing compensation packages for top management falls to the board of directors, but fiduciary duty rules are supposed to ensure that the board writes these contracts in the shareholders’ best interest. However the rapid rise in CEO compensation since the 1970s coincides with the emergence of a managerial power/rent extraction view (e.g., Bebchuk and Fried, 2004), that boards may be colluding to transfer wealth from shareholders to CEOs. In response, recent regulatory initiatives such as “Say on Pay” and the Dodd-Frank Act of 2010 aim to reinvigorate fiduciary duty rules, and thereby effectively to put shareholders back in control.\(^1\) The aim of the present paper is to study the consequences of a board acting in self-interest when contracting with the CEO in a setting that combines agency frictions and strategic communication.

What are the consequences of imperfect fiduciary duty rules? If a board grants a CEO an equity stake that seems excessive from the perspective of agency theory, is that a manifestation of the managerial power view? Furthermore, what will be the effects on social welfare of the recent attempts at establishing “more binding” regimes (e.g., Say on Pay)\(^2\)?

I investigate these issues in a setting where shareholders contract with the board, which in turn contracts with the CEO.\(^2\) In my model, the CEO is an

\(^{1}\)Say on Pay is one of the most prominent instruments to tighten fiduciary duty rules. Section 951 of the Dodd-Frank Act led to the SEC implementing a non-binding Say on Pay vote for executives executive from January 21, 2011. Despite the non-binding nature, failed Say on Pay voting outcome attracts public attention. Whether and how boards react to such voting outcome varies across cases. Citigroup failed Say on Pay with 55% opposition in 2012 after giving CEO Vikram Pandit three retention grants valued at $27.9 million. The board subsequently made changes to management compensation plans to satisfy the shareholders. In March 2018, shareholders of Walt Disney voted against the compensation paid to CEO Robert Iger in connection with the upcoming 21st Century Fox merger. Disney’s board said it would take the vote into account in future CEO compensation decisions. But it also said the terms of Mr. Iger’s extension were in Disney’s interests and essential to the deal’s success. In some cases, boards seem to ignore shareholder dissent, for example, Oracle’s shareholders have rejected the software maker’s executive compensation plan for six consecutive years.

\(^{2}\)Director compensation is not typically entitled to the presumption of the business judgment rule. Rather, it is usually reviewed under the “entire fairness” standard, which involves
empire builder endowed with private information about the firm’s environment. The board can learn about the firm’s environment through two channels: (a) by exerting costly effort to gather information and (b) by granting the CEO more equity, which effectively mutes his empire-building tendency and makes him more willing to share his private information. Unilateral information gathering and communication are substitute learning channels, but they are not valued equally by the shareholders and the board. Enhancing communication through greater CEO equity grants comes at dilution costs to both the shareholders and to the board. On the other hand, the board’s effort cost may not be fully internalized by the shareholders. In fact, I show that under plausible conditions, the shareholders do not have to reimburse the board at the margin for greater information gathering effort. This creates a potential conflict of interest between the board and the shareholders when it comes to designing CEO compensation: the board values communication more than the shareholders, all else being equal.

I begin with a benchmark setting (labelled the “binding regime”) where the shareholders directly contract with the board and the CEO. This setting serves as a metaphor for the case of perfectly binding fiduciary duty rules or binding Say on Pay. The shareholders in effect design compensation contracts for both parties with an eye to eliciting efforts and fostering communication, taking into account the dilution cost. As the empire-building tendency of the CEO increases, eventually the equity stake required to ensure communication becomes too high.

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3 On a technical level, for equity stake between zero and one and non-negative fixed payments, the board and CEO can secure a positive payoff by exerting zero effort and earn rents.

4 Say on Pay legislation was first adopted by the U.K. in 2002. Firms are required to hold a non-binding vote on the remuneration report of the directors. Since 2013, companies in the U.K. are further required to adopt a binding vote on the forward-looking policy report at least once every three years. Say on pay has become binding in the Netherlands (2004), Japan (2005), Sweden (2006), Norway (2007), Denmark (2007), Finland (2007), South Africa (2011) and Switzerland (2014). In March 2017, the EU approved the Shareholder Rights Directive, which requires firms to seek a binding vote on the forward-looking policy report for executives every three years, and a non-binding vote on the backward-looking implementation report every year.
and the shareholders give up on communication and provide the CEO with less equity but the board with more equity so as to boost information gathering incentives.

Then I turn to the more descriptive main setting (labelled “board discretion”) of imperfect fiduciary duty rules or imperfect enforcement, e.g., non-binding (or non-existent) Say on Pay regulations, in which the board designs the compensation package for the CEO in its own best interest. How will this affect the equilibrium pay packages for the CEO and the board, and the economic outcome? Because the board prioritizes communication to save effort costs, it is inclined to grant the CEO a higher equity stake in exchange for better communication. The main question is, how will the shareholders respond in equilibrium when they design the board’s compensation contract?

Anticipating that the board is inclined to grant the CEO more equity in exchange for improved communication, rational shareholders will choose the board’s equity grant so as to effectively implement one of two outcomes: (a) to give way to the board in its desire to foster communication (labelled the “acquiesce” outcome) or (b) to actively preempt CEO-board communication (labelled the “preempt” outcome). To implement (b), the shareholders need to increase the board’s equity grant so as to tilt the board’s preference between the two learning channels away from communication and toward costly information gathering.

While the shareholders will always be worse off in such a setting of board discretion than in the benchmark binding regime (by revealed preference), the implications for the board are more nuanced. If the shareholders acquiesce to

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5The model assumes that board has full discretion over management compensation in non-binding regime, whereas in practice, a legal regime with Say on Pay, even if non-binding, may have effects on executive compensation as boards may pay more attention to shareholders’ voice. One could view the board discretion setting as being at the extreme end of the spectrum of non-binding regimes, where boards have substantial discretion over CEO pay, such as countries without Say on Pay. Legal regimes with non-binding Say on Pay then can be viewed as a convex combination of the benchmark setting and the board discretion setting.
the board, it sounds good for the board but this is a “be careful what you wish for” situation. By improving communication through a greater CEO equity stake, the board would indeed be better off, holding fixed its own equity stake. However, in equilibrium, the shareholders anticipate the board’s behavior and will respond by lowering the board’s equity grant, because the value added by the board’s information gathering effort declines given the improved information flow from the CEO to the board. This reduced equity stake ultimately leaves the board worse off than in the benchmark binding regime. On the other hand, if the shareholders preempt CEO-board communication, the greater board equity stake required to make the board favor information gathering over communication ultimately leaves the board better off.

The somewhat ironic takeaway is, therefore, that whenever the board successfully gets away with fostering communication by granting the CEO a higher equity share in its own best interest, it will pay a price in terms of earning lower rents. Only if board discretion leaves the communication case unaltered compared with the benchmark, does the board benefit from having discretion.

I also study the implications of imperfect fiduciary duty rules for welfare. With board discretion, as the shareholders raise the board’s equity stake to preempt communication, the board is incentivized to exert more information gathering effort. The board internalizes only a fraction of the benefit from information gathering effort on firm value through its own equity share but bears all the cost, resulting in inefficient board effort levels. Board discretion therefore increases efficiency by mitigating this moral hazard problem. Put differently, while binding fiduciary duty rules are always beneficial to shareholders, my results show that they may reduce the expected payoffs to other parties (managers and boards, combined) by a greater amount, thereby reducing social welfare.

There are two main camps of thought in the policy debate regarding executive compensation and boards. The “managerial power view” (Bebchuk, Fried, and Walker, 2002; Bebchuk and Fried, 2003, 2004) suggests that the boards are
captured by management and set the CEO compensation as high as possible without attracting market discipline by corporate raiders. On the other end of the spectrum, the “shareholder value view” (Gabaix and Landier, 2008; Edmans and Gabaix, 2016) posits that boards set CEO contracts to maximize shareholder value. In my model, the fact that the board can be worse off with discretion runs counter to the view that boards collude with CEOs. On the other hand, the fact that the shareholders always suffer from board discretion sets the model apart from the shareholder value view. Departing from both camps, my model assumes that the board acts in its own interest, rather than aligning itself fully with either management or shareholders. Specifically, the board grants the CEO more equity to save effort costs and instead relies on communicating with the CEO, which resembles the “quiet life” à la Bertrand and Mullainathan (2003).

To better understand the agency problem when it comes to executive compensation, it is important to study boards as strategic, self-interested players. Much of the literature on boards has focused on monitoring and advising as well as board independence. In a multi-task moral hazard setting, Laux and Laux (2009) find that when the board gives the manager greater pay-performance sensitivity, it increases the incentive for the manager to manipulate earnings, which calls for more monitoring effort. Inefficiency arises if the board performs both tasks, because the board is inclined to under-incentivize the manager to reduce the burden of subsequent monitoring. The problem is mitigated by splitting the board into a compensation committee and an audit committee, because the former does not internalize the monitoring costs. Laux and Mittendorf (2011) show that a dependent board provides greater incentive pay which improves project

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6See also Hofmann, Huddart, and Pfeiffer (2018) for properties of optimal management compensation as net contracts in standard moral hazard setting. For a survey on CEO compensation, see Edmans et al. (2017).

7Hicks (1935): “the best of all monopoly profits is a quiet life.” Bertrand and Mullainathan (2003) refer to the term “quiet life” as managers' preference for avoiding difficulties and costly efforts, which also seems to apply to the setting of boards.

8See Adams, Hermalin, and Weisbach (2010) for a survey.
selection efficiency but at the cost of excessive CEO rents. Laux (2008) finds that if the board is more independent, the incumbent CEO is better able to use his information advantage to extract rents.\(^9\)

Hermalin and Weisbach (1998) model a bargaining game in which the selection of directors and CEO compensation are negotiated dynamically between the two parties.\(^10\) Drymiotes (2007) finds that fully independent boards have incentives to shirk on monitoring \textit{ex post}, after the agents’ productive inputs are sunk. Kumar and Sivaramakrishnan (2008) show that as directors become less dependent on the CEO, their monitoring efficiency may decrease, even as they improve the incentive efficiency of executive compensation contracts. Baldenius et al. (2014) study the interplay of board composition and decision making. Meng and Tian (2017) find that higher board expertise can hurt firm value. Adams and Ferreira (2007) show that management-friendly boards can be optimal in that CEO may be more willing to share information with the board.\(^11\)

Given the heated debate and ample research on executive compensation, how boards should be optimally incentivized by shareholders is relatively less well understood.\(^12\) Drymiotes and Sivaramakrishnan (2012) find that short-term incentives of board equity may have positive effects. Baldenius et al. (2018) study the non-pecuniary incentives of boards and show that the shareholders may optimally appoint a friendly or antagonistic board, depending on the CEO’s ability. In a setting where the board has unobservable and potentially misaligned incentives, Göx (2016) demonstrates that Say on Pay can impair the compensation policy of poorly governed firms.\(^13\)

\(^9\)Core, Holthausen, and Larcker (1999) find that CEOs receive greater compensation when governance structures are less effective. See also Core, Guay, and Larcker (2003) for a survey on CEO compensation and boards characteristics.

\(^10\)Related, Ryan and Wiggins (2004) empirically demonstrate that firms with more independent boards award directors more equity-based compensation.

\(^11\)Klein (1998) demonstrates that insider directors provide valuable advice to firms. Yermack (1996) provides evidence that small boards are more more effective.

\(^12\)Yermack (2004) studies the remuneration of outside directors in Fortune 500 firms.

\(^13\)See Larcker et al. (2015) and Malenko and Malenko (2017) for shareholder voting and proxy advisory firms. See also Ferri and Maber (2013) for evidence on Say on Pay affects CEO
The paper is organized as follows. Section 2 lays out the model. Section 3 considers the benchmark where the shareholders effectively design the CEO’s contract. Section 4 provides a counterfactual scenario with naive shareholders where the board has discretion over CEO compensation. Section 5 addresses the main setting with rational shareholders and board discretion. Section 6 discusses the properties of the equilibrium. Section 7 concludes. The Appendix contains all proofs (unless otherwise noted).

2 Model

A firm needs to tailor an investment decision (e.g., a merger or an acquisition) $y$ to the state of the world $\omega$. The decision rights rest with the firm’s board of directors. The CEO is endowed with private information that is relevant for the pending decision and can exert effort $a$ to increase firm value. The (gross) firm value is

$$V = M(a) + P(\omega, y),$$

where $M(a)$ denotes the benefit from the productive effort $a$ by the CEO at personal cost $G(a)$. The project value is $P(\omega, y) = \omega y - \frac{y^2}{2}$, which is maximized if the decision $y$ matches the true state $\omega$.

The CEO and the board are each compensated with equity stakes $\alpha_C, \alpha_B$, and fixed payments $F_C, F_B$, respectively. The CEO is an empire builder and derives non-pecuniary benefits from a larger project; denote the CEO’s empire-building tendency, or bias, by $b > 0$. For $EV = E_\omega[V]$, the expected payoffs to the CEO and the board are represented by:

$$EU_C = \alpha_C EV + bE[y] + F_C - G(a),$$

$$EU_B = \alpha_B (1 - \alpha_C) EV + F_B - C(e),$$

where $C(e)$ is the cost of information gathering effort $e$ incurred by the board to compensation in the UK.
be discussed shortly. The shareholders receive the residual claim:

\[ EU_{SH} = (1 - \alpha_B)(1 - \alpha_C)EV - F_B - F_C. \] (3)

For simplicity, I consider a binary state distribution, \( \omega \in \{L, H\} \), where each state occurs with equal probability. In line with compensation practice, I focus on linear equity compensation arrangements, \( \alpha_k \in [0, 1] \), and non-negative base salaries, \( F_k \geq 0, k = C, B \). The investment decision \( y \) is continuous, \( y \in \mathbb{R} \).

Neither party observes the state realization, but the CEO has access to an informative signal \( s \in \{L, H\} \) with precision \( q \), i.e., the signal is the same as the state \( \omega \) with probability \( q > \frac{1}{2} \).

The board can exert information gathering effort, \( e \), at cost \( C(e) = \frac{ce^2}{2} \), \( c > 0 \). With probability \( e \) the board perfectly discovers the state \( \omega \), with probability \( 1 - e \), the board remains uninformed. For simplicity, let CEO’s productive effort be \( a \in \{0, 1\} \), \( M(a) = ma \) and \( G(a) = a \), where \( m \) is a known constant sufficiently high to ensure the shareholders always find it profitable to induce CEO effort. Refer to

\[ \alpha_C \equiv \frac{1}{m} \]

as the effort CEO equity stake which is the minimum level of equity that ensures the CEO is willing to exert effort.

If information gathering fails to uncover the state, the board seeks to learn at least the CEO’s informative signal through communication. To capture the soft nature of the communication between the board and the CEO inside the boardroom, communication takes the form of cheap talk as in Crawford and Sobel (1982). Given the CEO’s inherent bias of \( b \), note that the CEO becomes more aligned with the shareholders and the board as the equity stake \( \alpha_C \) increases. I refer to the effective CEO bias as \( \frac{b}{\alpha_C} \). The bliss points of the players, i.e., their preferred investment levels, are derived from their payoffs\(^{14}\) as stated in

\(^{14}\)To see that, it is useful to restate the project value in the form of quadratic loss: \( P(\omega, y) = \frac{1}{2}\omega^2 - \frac{1}{2}(y - \omega)^2 \).
(1), (2)and (3), and are as follows:

\[ y_C = \omega + \frac{b}{\alpha_C}, \quad y_B = y_{SH} = \omega. \]

The solution to the communication subgame is bang-bang in that \emph{perfect communication} obtains if \( \frac{b}{\alpha_C} \leq \frac{\Delta}{2} \), where \( \Delta \equiv \mathbb{E}[\omega|s = H] - \mathbb{E}[\omega|s = L] = (2q - 1)(H - L) \) captures the significance of the information asymmetry. On the other hand, if \( \frac{b}{\alpha_C} > \frac{\Delta}{2} \), then \emph{babbling} (uninformative communication) is the unique equilibrium.\(^{15}\) While babbling is always an equilibrium of a cheap talk game, following the literature, I focus on the most informative equilibrium. Going forward I will use \( s \) for perfect communication, and \( \emptyset \) for babbling to indicate which communication case is anticipated along the equilibrium path.

It is worth noting that the key difference to Crawford and Sobel (1982) is that the effective CEO bias \( \frac{b}{\alpha_C} \) is a function of the CEO equity stake \( \alpha_C \). The CEO equity stake, as in Baldenius et al. (2018), therefore plays an important role beyond incentivizing the CEO’s value adding action \( a \). Holding a greater stake in the firm, the CEO is more willing to communicate his private signal to the board. Refer to

\[ \tilde{\alpha}_C(b) \equiv \frac{b}{\frac{\Delta}{2}} \]

\(^{15}\)The cheap talk subgame is a special case of Crawford and Sobel (1982). Normalize the report space to be the same as the signal space, \( r \in \{L, H\} \). The strategy of the CEO (sender) is the probability of sending report \( r \) upon observing signal \( s \), denoted by \( \sigma(r|s) \). The strategy of the board (receiver) is taking the investment decision given the CEO’s report, denoted by \( \bar{y}(r) \in \mathbb{R} \). Beliefs are updated by Bayes’ rule. If the board conjectures that the CEO chooses \( r \) according to strategy \( \sigma(r|s) \), then upon receiving the report, the board’s posterior belief about the state \( \omega \) is \( \Gamma(\omega|r) \). A Perfect Bayesian Equilibrium of the subgame is a strategy-belief profile \( (\sigma(r|s), \bar{y}(r), \Gamma(\omega|r)) \) consisting of the board’s decision rule:

\[ \bar{y}(r)^* \in \arg\max_{y \in \mathbb{R}} \text{EU}_B(\bar{y}(r), \omega), \]

and the CEO’s reporting strategy:

\[ \sigma(r|s)^* \in \arg\max_{\sigma \in [0,1]} \text{EU}_C(\bar{y}(r), \omega)\Gamma(\omega|r), \]

and the board’s posterior belief \( \Gamma(\omega|r) \) follows Bayes’ rule whenever possible.
as the communication CEO equity stake, which is the minimum equity stake for which perfect communication becomes an equilibrium under cheap talk. The relationship between the CEO equity stake and the communication case is stated as follows:

\[
\text{If } \alpha_C \begin{cases} \geq & \hat{\alpha}_C(b), \text{ then } \\
< & \end{cases}
\begin{align*}
\text{Perfect Communication,} \\
\text{Babbling.}
\end{align*}
\]

To summarize, there are two channels for the board to learn about the firm’s environment: by exerting costly information gathering effort and by cheap-talk communication with the CEO. More board equity gives the board greater incentive to exert effort, which enhances information discovery. On the other hand, a higher CEO equity stake improves communication by muting the CEO’s empire-building tendency.

3 Benchmark: Binding Regime

As a benchmark, consider the scenario where the shareholders fully control the CEO’s pay package, e.g., Say on Pay is binding. I refer to this benchmark as the “binding regime.” The shareholders effectively set the compensation contracts for the CEO as well as for the board to induce effort and communication.\(^{16}\) The board exerts effort to gather information and makes the investment decision. The timeline is shown in Figure 1. At Date 1, the shareholders choose a compensation package for the board and the CEO. At Date 2, the board chooses information gathering effort \(e\), and the CEO chooses productive effort. With probability \(e\), information gathering is successful and the board learns the state \(\omega\). With probability \(1 - e\), information gathering fails, but as a fallback the board can learn the CEO’s report \(r\) through communication. At Date 3, the board chooses the investment \(y\). Finally at Date 4, payoffs of the players are realized.

\(^{16}\)The shareholders’ control over the CEO contract here is from the ex ante perspective. Ferri and Göx (2018): “In fact, some European countries such as the Netherlands or Sweden have recently adopted a pre-contractual (i.e., prospective) binding Say on Pay.”
At Date 3, if the board’s information gathering effort fails, the information loss from the investment decision depends on the informativeness of the CEO’s report r in the communication subgame. Denote the information loss by $\Lambda_j \equiv \mathbb{E}_j[(y(r) - \omega)^2]$, where $j \in \{s, \emptyset\}$ indicates the communication case. Specifically, the case-wise information loss is

$$\Lambda(\alpha_C, b) = \left\{ \begin{array}{ll}
\Lambda_s \equiv \mathbb{E}_s[Var(\omega | s)] = q(1 - q)(H - L)^2, & \text{for } \alpha_C \geq \hat{\alpha}_C(b), \\
\Lambda_\emptyset \equiv Var(\omega) = \frac{(H - L)^2}{4}, & \text{for } \alpha_C < \hat{\alpha}_C(b).
\end{array} \right. \quad (5)$$

Taking into account that in equilibrium the CEO will always exert effort $a = 1$ (which will be ensured by an appropriate incentive constraint), the expected firm value can be restated as follows:

$$EV(e, \alpha_C, b) = m + \frac{1}{2} \mathbb{E}[\omega]^2 - \frac{1}{2} \mathbb{E}(y - \omega)^2$$

$$= m + \frac{1}{2} \mathbb{E}[\omega]^2 - (1 - e) \frac{\Lambda(\alpha_C, b)}{2}. \quad (6)$$

The expected firm value is the sum of the value added by the CEO’s effort and the project value, factoring in the expected information loss and the board’s information gathering effort. To be specific, with probability $e$, information gathering successfully discovers the true state, removing any information loss; with complementary probability the information gathering fails, and the information loss is $\Lambda(\alpha_C, b)$, given by (5). Going forward I will use the vector notation $\alpha \equiv (\alpha_B, \alpha_C)$.
and $F \equiv (F_B, F_C)$ to represent the compensation components for the board and the CEO. Expected payoffs of the players\textsuperscript{17} are stated as follows:

\begin{align*}
EU_C(e, \alpha, F, b) &= \alpha_C EV(e, \alpha_C, b) + bE[y] + F_C - 1, \\
EU_B(e, \alpha, F, b) &= \alpha_B (1 - \alpha_C) EV(e, \alpha_C, b) + F_B - \frac{ce^2}{2}, \\
EU_{SH}(e, \alpha, F, b) &= (1 - \alpha_B) (1 - \alpha_C) EV(e, \alpha_C, b) - F_B - F_C,
\end{align*}

(7)

(8)

(9)

At Date 2, the board chooses its information gathering effort to maximize its expected payoff in [8], which reads

\[ EU_B(e, \alpha, F, b) = \alpha_B (1 - \alpha_C) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - (1 - e) \frac{\Lambda(\alpha_C, b)}{2} \right] + F_B - \frac{ce^2}{2}. \]

When choosing effort, the board trades off the benefit from information discovery and the effort cost. Specifically, the optimal effort chosen by the board—determined by the first-order condition—is given by:

\[ e^*(\alpha_B, \alpha_C, b) = \frac{\alpha_B (1 - \alpha_C)}{2c} \Lambda(\alpha_C, b). \]

(10)

The board equity stake $\alpha_B$ and information loss $\Lambda(\cdot)$ are complements in eliciting information gathering effort. To see that, note that the potential benefit of information gathering comes from the information loss avoided. The greater the board equity stake, the more the board can internalize the benefit. A larger CEO equity stake $\alpha_C$, however, reduces the marginal benefit of $e$ to the board through dilution. Thus, the equity stakes granted to the board and to the CEO, respectively, are substitutes in eliciting board effort. Denote by $EU_k(\alpha, F, b) \equiv EU_k(e^*(\cdot), \alpha, F, b)$ player $k$’s value function, incorporating the equilibrium board effort, $k = SH, B, C$.

At Date 1, anticipating the actions taken by the board and the CEO, for given CEO bias $b$, the shareholders choose $(\alpha, F)$ to maximize their value function. At

\textsuperscript{17}Note that $(\alpha, F)$ may be degenerated for a specific player’s payoff: the shareholders’ payoff $EU_{SH}(\cdot)$ is a function of $(\alpha_B, \alpha_C, F_B, F_C)$; the board’s payoff $EU_B(\cdot)$ is a function of $(\alpha_B, \alpha_C, F_B)$; the CEO’s payoff $EU_C(\cdot)$ is a function of $(\alpha_C, F_C)$.
Date 1, the shareholders solve the following program:

$$\mathcal{P}^*_{SH} : \max_{\alpha_B, \alpha_C \in [0, 1], F_B, F_C \geq 0} EU_{SH}(\alpha, F, b),$$

subject to:

$$EU_k (\alpha, F, b) \geq 0, \text{ for any } k = B, C \quad (IR_k)$$

$$\alpha_C \geq \alpha_C. \quad (IC_C)$$

The solution to this benchmark program is denoted by $$(\alpha^*, F^*)$$. In equilibrium the fixed payments will be zero, i.e., $F^*_k = 0$. To see that the individual rationality constraints of the board and the CEO are slack, note that each party can secure positive expected payoffs by exerting zero effort. Hence I drop the fixed payments of the players for the remainder of this section.

The shareholders choose board equity stake to trade off the board’s information gathering effort incentive with the dilution cost. The optimal board equity stake is derived from the first-order condition, and is given by

$$\alpha_B(b) = \frac{1}{2} - \frac{m + \frac{1}{2}E[\omega]^2 - \Lambda(\alpha_C(b), b)}{[1 - \alpha_C(b)] \frac{\Lambda(\alpha_C(b), b)^2}{2c}}. \quad (11)$$

For very low levels of CEO bias,

$$b \leq b \equiv \frac{\Delta}{2} \alpha_C,$$

communication comes for free because the effort CEO equity stake is sufficient for perfect communication to ensue, i.e., babbling is not feasible, because $\hat{\alpha}_C(b) \leq \alpha_C$. For $b > b$ both communication cases can arise depending on the CEO’s equity stake.\[^{18}\] Denote by $\alpha^j_C(b)$ the CEO equity stake chosen by the shareholders to induce communication case $j \in \{s, \emptyset\}$, specifically:

$$\alpha_C(b) = \begin{cases} 
\alpha^s_C(b) = \hat{\alpha}_C(b), & \text{to induce Perfect Communication}, \\
\alpha^\emptyset_C = \alpha_C, & \text{to induce Babbling}.
\end{cases} \quad (12)$$

\[^{18}\] For very low $c$ an uninteresting case may arise where the shareholders do not need to foster communication using the CEO equity stake and constantly choose $\alpha_C$. To focus on the interesting case, I assume $c > c$. 

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Denote $\alpha^j_B(b)$, where $j \in \{s, \emptyset\}$, as the optimal board equity stake, as stated in (11), with $\Lambda(\alpha_C(b), b)$ as in (5), and $\alpha^j_C(b)$ as in (12). The first result describes the solution to the benchmark setting:

**Proposition 1 (Benchmark)** In the binding regime where the shareholders effectively design the compensation for both the board and the CEO, there exists $b_0$ such that the shareholders implement perfect communication for $b \in (\underline{b}, b_0)$, and babbling for $b \geq b_0$.

(i) For $b \in (\underline{b}, b_0)$, the shareholders choose $\alpha^*_C = \alpha^s_C(b) = \hat{\alpha}_C(b)$, $\alpha^*_B = \alpha^s_B(b)$, resulting in perfect communication.

(ii) For $b \geq b_0$, the shareholders choose $\alpha^*_C = \alpha^\emptyset_C = \underline{\alpha}_C$, $\alpha^*_B = \alpha^\emptyset_B$, resulting in babbling.

The benchmark is a special case of Baldenius et al. (2018). For moderate CEO bias (case (i)), the shareholders actively induce communication by granting the CEO sufficient equity to mitigate his empire-building tendency. The required CEO equity grant for communication to ensue increases with CEO bias and eventually becomes so high that the shareholders give up on communication and instead rely more on information gathering by the board (case (ii)).

When choosing the board equity stake, the shareholders trade off the information gathering effort incentive and dilution cost. At the threshold $b_0$ where the regime change occurs, note that the information loss jumps up while dilution from CEO equity stake jumps down under babbling. Therefore the shareholders grant the board more equity compared with that under communication. This model feature will play a role in the subsequent analysis.

As stated earlier, there is a potential conflict of interest between the shareholders and the board when it comes to the CEO’s equity grant. The reason rests in the differential costs across the two information channels. By calibrating the equity stakes of the CEO and the board, the shareholders control both
board effort and CEO-board communication. However, fostering communication requires a higher equity incentive for the CEO, which always dilutes the shareholders’ claim in firm value. On the other hand, the board’s information gathering effort is costly to the board but, at the margin, not to the shareholders, because the board’s participation constraint is slack. All else being equal, hence, the board attaches a higher value to communication than do the shareholders.

4 Counterfactual: Board Discretion, Naive Shareholders

For the remainder of the paper I consider a setting in which fiduciary duty rules such as Say on Pay are non-binding, i.e., the board can set the CEO compensation in its own interest.\(^\text{19}\) I refer to this as the “board discretion” setting. As a prelude to the analysis of the main setting, consider as a counterfactual a setting in which the board has discretion but the shareholders naively believe the board will design the CEO compensation in their best interest. Naive shareholders therefore offer the same contract to the board as in the benchmark. The strategic board accepts the contract and decides whether to deviate by designing a different CEO contract than the one preferred by the shareholders. By adjusting how closely to align the CEO’s preference over the project choice, the board effectively gains control over the communication case. The board’s optimal effort is again derived from the first-order condition as in (10). At date 2, the board solves the following program, taking as given its own equity stake \(\alpha_B\):

\[
\mathcal{P}_B: \text{ for given } \alpha_B, b, \max_{\alpha_C \in [0,1], F_C \geq 0} E U_B(\alpha, F, b),
\]

subject to:

\[
E U_C(\alpha, F, b) \geq 0, \quad (IR_C)
\]

\[
\alpha_C \geq \alpha_C. \quad (IC_C)
\]

\(^\text{19}\)To be more descriptive, the board discretion setting could be interpreted as a world without Say on Pay. In practice the non-binding Say on Pay regime may constitute a convex combination of no Say on Pay regime and binding Say on Pay regime.
Denote the solution to this program by $(\tilde{\alpha}_C(\alpha_B, b), \tilde{F}_C(\alpha_B, b))$. In equilibrium the fixed payments to the board and to the CEO will again be zero. Hence I suppress $F_k$ for the remainder of the section. For naive shareholders, $\alpha_B = \alpha_B^*$ (benchmark). As for the equity stake of the CEO, the board will choose the same CEO equity stake as the shareholders would choose to induce a certain communication case, as given by (12).

I now study the board’s incentives when contracting with the CEO. Denote by $EU^j_k(\alpha_B, \alpha_C, b)$ the value function of player $k$ anticipating communication case $j$ along the equilibrium path. Define the difference in the board’s expected payoff under perfect communication and babbling, respectively, given $\alpha_B^*$, as

$$D^*_B(b) \equiv D_B(\alpha_B^*(b), b) \equiv EU^*_B(\alpha_B^*(b), \alpha_C^*(b), b) - EU^\emptyset_B(\alpha_B^*(b), \alpha_C^\emptyset, b).$$ (13)

The board will have an incentive to deviate from the communication case that the shareholders desire, if one of the following two cases arises: $D^*_B(b) < 0$ for $b < b_0$, or $D^*_B(b) > 0$ for $b > b_0$.

**Lemma 1** If the shareholders prefer perfect communication in the benchmark, then if the board has discretion when contracting with the CEO, the board would have no incentive to induce babbling, i.e., $D^*_B(b) > 0$, for any $b \leq b_0$.

The shareholders trade off efforts, communication and dilution, and at the margin the board evaluates this tradeoff in the same way but also internalizes the effort cost. Given that the effort cost is higher under babbling than under perfect communication, the board values perfect communication more than the shareholders do.

**Lemma 2** There exists a non-empty set of CEO bias parameters such that the board “flips” the regime from babbling to perfect communication by setting $\alpha_C = \hat{\alpha}_C(b)$. Specifically, there exists some $\epsilon > 0$ such that $D_B(\alpha_B^\emptyset(b), b) > 0$, for any $b \in (b_0, b_0 + \epsilon)$. 

16
Lemma 2 identifies a conflict of interest in that just above the benchmark cutoff for the CEO bias (identified in Proposition 1), the shareholders prefer babbling but the board still prefers perfect communication (given its own benchmark equity stake). The required CEO equity grant to induce perfect communication increases with CEO bias, leading to higher dilution costs to the board. Eventually the dilution costs outweigh the saved effort costs, and the board finds it optimal to induce babbling as the shareholders desire. Define $\hat{b}$ as the CEO bias cutoff where the board is indifferent between babbling and perfect communication given the shareholders have chosen the board’s equity stake as the one to induce babbling in the benchmark; formally $D_B(\alpha^\emptyset_B, \hat{b}) \equiv 0$.

**Lemma 3** The interests of the board and the shareholders are perfectly aligned for very small and very large CEO bias:

(i) For $b \leq b_0$, both the shareholders and the board prefer communication.

(ii) For $b \geq \hat{b}$, both the shareholders and the board prefer babbling.

For small CEO bias, the shareholders prefer perfect communication, and a fortiori so does the board. For large CEO bias, the cost to the board of fostering communication is too high because, as stated previously, the communication CEO equity stake in (4) increases with CEO bias. Therefore the board will not deviate to perfect communication for $b \geq \hat{b}$. Define the area of interest as $b \in B \equiv (b_0, \hat{b})$.

**Lemma 4** For $\epsilon \to 0^+$, $D_B(\alpha^s_B(b), b_0 - \epsilon) < D_B(\alpha^\emptyset_B, b_0 + \epsilon)$.

For CEO bias just above the benchmark cutoff, naive shareholders offer a higher equity stake to the board than the one they would have offered to induce perfect communication, but in doing so they are leaving money on the table. Not only will the board opt for perfect communication, instead of babbling as
the shareholders desire, but the board also earns excessive rents from the “windfall” equity stake. Rational shareholders would at least partly want to extract the rent by adjusting the board equity stake. More generally, they may want to redesign the board’s compensation package in anticipation of the conflict of interest described in this section.

5 Main Setting: Board Discretion, Rational Shareholders

In this section, I continue to assume that the board has discretion over CEO compensation, but now the shareholders rationally anticipate the board’s incentive to induce a communication game that suits its own preferences. Therefore, if the shareholders want to induce a certain communication case along the equilibrium path, they must choose their remaining contracting instrument—namely, the board’s equity stake $\alpha_B$—in such a way that the board implements that communication case when contracting with the CEO. Figure 2 illustrates the timeline, which is otherwise similar to the benchmark, except that now the board, instead of the shareholders, designs CEO compensation. At Date 1, the shareholders solve the following program:

$$\mathcal{P}_{SH}^{**} : \max_{\alpha_B \in [0, 1], F_B \geq 0} \quad EU_{SH}(\alpha, F, b),$$
subject to:

$$EU_B(\alpha, F, b) \geq 0, \quad (IR_B)$$

$$\alpha_C, F_C \in \arg\max_{\alpha_C \in [0, 1], F_C \geq 0} \quad EU_B(\alpha, F, b). \quad (IC_{Comm}^B)$$

The board’s incentive compatibility constraints in connection with communication are stated generically and will be made more specific below. Denote the solution to this program by $(\alpha_B^{**}, F_B^{**})$. As in previous sections, in equilibrium

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20 The dilution structure in this model is multiplicative instead of additive as in Baldenius et al. (2018), which does not qualitatively change the results for the benchmark setting; for the main setting, with the additive structure communication comes for free and the board is even more inclined to grant the CEO more equity.
the fixed payments will be zero and I henceforth suppress $F_k$. Note that the key difference to the benchmark is that the shareholders now face extra constraints regarding the board’s communication incentives.

For $b \in B \equiv (b_0, \hat{b})$, the shareholders now face the choice between two outcomes: (a) to acquiesce to communication, which the board prefers, and (b) to preempt communication; i.e., the shareholders compare the values of two discrete programs $P_{SH}^s$ vs. $P_{SH}^\emptyset$. If babbling is anticipated along the equilibrium path, the board will choose $\alpha_C^\emptyset = \alpha_C$,\(^{21}\) while the shareholders will choose $\alpha_B$ to maximize $EU_{SH}^\emptyset$ subject to a babbling constraint:

$$P_{SH}^\emptyset : \max_{\alpha_B \in [0,1]} EU_{SH}^\emptyset(\alpha_B, \alpha_C, b)$$

subject to:

$$EU_B^\emptyset(\alpha_B, \alpha_C^\emptyset, b) \geq EU_B^s(\alpha_B, \alpha_C^s(b), b). \quad (IC_B^\emptyset)$$

On the other hand, if perfect communication obtains in equilibrium, the board will choose $\alpha_C^s(b) = \hat{\alpha}_C(b)$, with $\hat{\alpha}_C(b)$ as defined in [4], while the shareholders

\(^{21}\)Recall that setting $\alpha_C$ above $\alpha_C$ only fosters communication while adding to the dilution cost.
will choose $\alpha_B$ to maximize $EU^{s}_{S \cap H}$ subject to a \textit{perfect communication constraint}:

$$P^{s}_{S \cap H} : \max_{\alpha_B \in [0,1]} EU^{s}_{S \cap H}(\alpha_B, \alpha_C, b)$$
subject to:

$$EU^{s}_{B}(\alpha_B, \alpha_C^s(b), b) \geq EU^{\emptyset}_{B}(\alpha_B, \alpha_C^\emptyset, b). \quad (IC^s_B)$$

As the board attaches a higher value to communication, it can be verified that in equilibrium the perfect communication constraint will be slack. The maximum achievable payoff of $P^{**}_{S \cap H}$ is the upper envelope of the two programs’ payoffs. Denote by $\hat{\alpha}_B(b)$ the board equity stake such that the board is indifferent between perfect communication and babbling, i.e.,

$$D_B(\hat{\alpha}_B(b), b) \equiv 0.$$ 

The next result describes the solution to the main setting for the area of interest:

**Proposition 2 (Main Setting)** If the board has discretion when contracting with the CEO, there exists $b_{00} \in B \equiv (b_0, \hat{b})$ such that the shareholders induce perfect communication for $b \in Bs \equiv (b_0, b_{00}]$ and babbling for $b \in B^\emptyset \equiv (b_{00}, \hat{b})$.

(i) For $b \in Bs$, the shareholders choose $\alpha^{**}_B = \alpha^{s}_B(b)$, the board chooses $\alpha^{**}_C = \hat{\alpha}_C(b)$, resulting in perfect communication;

(ii) For $b \in B^\emptyset$, the shareholders choose $\alpha^{**}_B = \hat{\alpha}_B(b) > \alpha^{\emptyset}_B$, the board chooses $\alpha^{**}_C = \alpha_C$, resulting in babbling.

Recall that in the benchmark, where the shareholders control the compensation for both the CEO and the board, they could perfectly tailor the board’s equity stake to trade off board and CEO efforts, communication benefits, and dilution costs. When the control over CEO compensation effectively shifts to the board, however, the shareholders face extra constraints, because the board is inclined to foster communication. Whenever the babbling constraint is binding, as it is by construction for any $b \in B$, the shareholders are no longer able
to sustain the babbling equilibrium with the same board equity stake as in the benchmark. To preempt communication and to provide effort incentives for the board, they will have to raise the board’s equity stake to $\tilde{\alpha}_B(b)$ to make it more costly for the board to deviate.

When the board decides whether to induce communication, it faces the following tradeoff. The benefit from inducing perfect communication is effort cost savings; the cost is greater dilution of firm value because fostering communication requires granting the CEO more equity. As the empire-building tendency of the CEO increases, so does the communication CEO equity stake, which relaxes the babbling constraint. I refer to $b \in B^s$ as mild CEO bias, and $b \in B^0$ as severe CEO bias.

For mild CEO bias ($b \in B^s$), the shareholders find it advantageous to acquiesce to communication, because (a) even in the benchmark they only had a mild preference for babbling, and (b) the cost of preventing communication is high, because the board strongly prefers communication. On the other hand, if the empire-building tendency of the CEO is severe ($b \in B^0$), both arguments reverse: the shareholders have a stronger preference for babbling, and the shadow cost of the babbling constraint is small (even the board does not have a strong preference for perfect communication any more). Therefore, the shareholders find it optimal to induce babbling. In between there exists a cutoff where the shareholders are again indifferent between inducing communication and babbling along the equilibrium path. The key difference to the benchmark setting is that, now this regime change occurs at a higher CEO bias level ($b_0 > b_0$), i.e., the communication region is larger as a result of board discretion.

6 Properties of the Equilibrium

In this section I discuss the key properties of the outcome in the main setting and contrast them with the benchmark. As argued above, the board attaches greater
value to communication than the shareholders do. I first address the question whether having board discretion over executive pay packages indeed leads to a higher equity stake for the CEO. Moreover, how would the shareholders respond in equilibrium when they design the board’s compensation contract.

**Corollary 1 (The Optimal Equity Stake)**

(i) With discretion, the board grants weakly more equity to the CEO than the shareholders would do in the benchmark: for \( b \in B^s \), \( \alpha^{**}_C > \alpha^{*}_C \), while for \( b \in B^\emptyset \), \( \alpha^{**}_C = \alpha^{*}_C = \alpha_C \).

(ii) The board receives less equity (than in the benchmark) if the shareholders acquiesce to communication, and more equity if shareholders preempt communication: for \( b \in B^s \), \( \alpha^{**}_B < \alpha^{*}_B \), while for \( b \in B^\emptyset \), \( \alpha^{**}_B > \alpha^{*}_B \).

Because of the board’s inclination towards communication, the board grants the CEO a weakly higher equity stake than the shareholders would. Such behavior is typically interpreted as “friendly” boards whose preferences are aligned with those of the CEO, transferring shareholder wealth to the CEO.

**Fig. 3: Optimal Equity Stakes**

\( H = 25, \ L = 0, \ m = 50, \ q = 0.58, \ c = 35 \).

Blue line denotes benchmark, red line denotes main setting.
Vertical dashed lines are \( b \) cutoffs: yellow \( b \); purple \( b_0 \); green \( b_{00} \).
however, the board is not intrinsically biased regarding the decision itself. Instead, it grants the CEO more equity because doing so improves communication, which in turn saves effort costs. This is in line with the “quiet life” hypothesis of Bertrand and Mullainathan (2003), applied here to boards of directors.

For mild CEO bias \( (b \in B^s) \), the shareholders acquiesce to perfect communication. Although the board gets away with a larger communication region, the shareholders react by muting the board’s equity incentives. There are two reasons for this: (a) the fact that perfect communication is anticipated along the equilibrium path lowers the value of the board’s information gathering effort, and therefore the board equity stake is less effective in eliciting board effort; (b) dilution due to the CEO equity stake required for perfect communication reduces the marginal benefit of board effort. Both arguments follow from the board’s effort incentive condition in (10).

On the other hand, for severe CEO bias \( (b \in B^d) \), the babbling constraint is relaxed, and the shareholders find it advantageous to preempt communication. To make it too costly for the board to induce perfect communication, the shareholders grant the board an equity stake that is greater than in the benchmark. Figure 3 illustrates these results.

These findings for the board’s equity stake have implications for the board’s expected payoffs. Specifically, I now address the question whether the board will ultimately benefit from having discretion over the CEO’s compensation contract, and thereby the communication setting:

**Proposition 3 (Board Payoff)** With discretion over CEO compensation, the board is worse off compared to the benchmark if the shareholders acquiesce to communication, and better off if the shareholders preempt communication. Specific-
Fig. 4: Shareholders and Board Payoffs

$H = 25$, $L = 0$, $m = 50$, $q = 0.58$, $c = 35$.

Blue line denotes benchmark, red line denotes main setting.
Vertical dashed lines are $b$ cutoffs: yellow $b_c$; purple $b_0$; green $b_{00}$.

cally:

(i) For $b \in B^*$, $EU^{**}_B < EU^*_B$;

(ii) for $b \in B^0$, $EU^{**}_B > EU^*_B$.

One might expect that having discretion over the CEO’s compensation contract should leave the board better off, because it can induce a communication outcome that allows it to economize on information gathering costs. While this would indeed be true if one were to fix the board’s own equity grant $\alpha_B$, as in Section 4 (counterfactual), in equilibrium rational shareholders will adjust $\alpha_B$ to the fact that the board is now empowered.

For mild CEO bias levels for which the shareholders acquiesce to communication ($b \in B^*$), there is a curse to the board. While the board can indeed save on effort costs, and hence enjoy the “quiet life”, it pays a price in terms of receiving less equity. At the same time, to facilitate communication, the board needs to grant the CEO more equity, adding to the dilution cost. This “double whammy” emanating from the equity incentives ultimately pushes the board’s expected payoff below the benchmark level.
To preempt communication for severe CEO bias \((b \in B^0)\), on the other hand, the shareholders will have to grant the board more equity to ensure the board does not opt for perfect communication. Given that, in equilibrium, the communication case ends up being the same as in the benchmark (babbling), the greater equity stake for the board as a result of the board having discretion implies greater rents for the board.

Therefore it is somewhat ironic that whenever the board successfully flips the communication case in its own best interest (from babbling to perfect communication), it will earn lower rents. Only for those parameters for which board discretion leaves the communication case unaltered, does the board benefit from its power. The fact that the board can be worse off by having discretion stems from its inability to commit to act in the shareholders’ best interest. This suggests that the board may benefit from hiring an independent compensation consultant as a way to strengthen its commitment to fiduciary duty rules.

I now turn to the other players and ask how they are affected by the board having discretion over CEO compensation.

**Corollary 2 (Shareholders’ Payoff)** Shareholders are worse off when the board has discretion over CEO compensation: for \(b \in B\), \(EU_{SH}^* > EU_{SH}^{**}\).

The shareholders are always better off having control over CEO compensation, by revealed preference, because they could always replicate the CEO pay package the board would choose. Board discretion over CEO compensation simply introduces additional constraints to the shareholders’ optimization problem, which can only leave them weakly worse off. For all CEO bias values in the “critical” range \((b \in B)\), this loss turns out to be strict. Figure 4 illustrates the equilibrium payoffs to the shareholders and to the board.

I now turn to the payoff to the CEO and ask if the CEO benefits from board discretion.\(^{24}\)

\(^{24}\)When considering the CEO’s expected payoff, a “money pump” issue arises with the
Corollary 3 (CEO Payoff) For $b \in B^0$, the CEO is strictly better off when the board has discretion over CEO compensation, $EU^*_C > EU^*_C$.

For CEO bias levels for which the shareholders preempt communication, the board receives more equity and exerts more information gathering effort than in the benchmark. Higher level of board effort leads to higher firm value, given that in equilibrium the communication case ends up being the same as in the benchmark (babbling). It follows that the CEO receives the same equity stake ($\alpha_C$) in both settings, and the difference in the CEO’s payoff only comes from the differential firm value. Therefore for $b \in B^0$, the CEO is better off in the main setting with board discretion. For CEO bias levels for which the shareholders acquiesce to communication, evaluating the effects of board discretion on the CEO’s expected payoff is complicated by the differential information loss terms across communication regimes. Numerical analysis (e.g., Figure 5, left panel) suggests that the CEO will be better off with board discretion also in the region $b \in B^*$, not covered in Corollary 3.

I now ask how board discretion over CEO pay affects social welfare. Define welfare as the sum of the expected payoffs to the shareholders, the board, and the CEO, which reads

$$W(\cdot) = EV(\cdot) + bE[y] - C(e) - G(a).$$

Corollary 4 (Welfare) For $b \in B^0$, board discretion strictly increases welfare, $W^{**} > W^*$.

Again, when shareholders actively preempt communication, as stated above, the board’s information gathering effort is greater than in the benchmark, and the communication case ends up being babbling in both settings. In this case, a higher level of board effort leads to greater welfare. The reason is that, when the main exogenous variable, the CEO bias $b$. As $b$ increases, the CEO’s expected payoff increases mechanically, all else being equal. The same issue arises in connection with welfare because it comprises CEO payoff.
board chooses effort, it internalizes only a fraction of the benefit of such effort (an increase in firm value) but bears all the cost. Therefore, while binding fiduciary duty rules are always beneficial to shareholders, they may result in inefficient efforts and hence lower welfare. Board discretion may enhance efficiency by alleviating this moral hazard problem. This suggests an unintended consequence of recent regulatory attempts to implement more binding regimes. For CEO bias levels for which the shareholders acquiesce to communication, evaluating the effects of board discretion on welfare is again complicated by the differential information loss terms across communication regimes. Numerical analysis (e.g., Figure 5, right panel) suggests that the welfare is lower with board discretion in the region $b \in B^s$, not covered in Corollary 4.

7 Conclusion

This paper studies the effects of a self-interested board designing CEO pay. While this leads indeed to weakly greater CEO equity stakes, my model suggests it may not be that boards are captured by CEOs and act in the latter’s interest, but instead they prefer a “quiet life” à la Bertrand and Mullainathan (2003). A higher

\[ H = 25, \ L = 0, \ m = 50, \ q = 0.58, \ c = 35. \]

Blue line denotes benchmark, red line denotes main setting.
Vertical dashed lines are $b$ cutoffs: yellow $b_1$; purple $b_0$; green $b_00$.
CEO equity stake ensures smooth information flow from CEO to board and absolves the board from engaging in costly information gathering effort. Such effort however is marginally beneficial to the shareholders, who value it more than the board does. To counter the board’s tendency to induce excessive communication, which comes at the expense of board monitoring, the shareholders may need to grant more equity to the board. The somewhat ironic finding is that the board is better off with its power only if in equilibrium it cannot get away with its desire for communication, and worse off if it can. This suggests that the board may benefit from hiring an independent compensation consultant to enhance its commitment to fiduciary duty rules. Given the recent international trend of pushing for more binding Say on Pay regimes, it is a relevant question for regulators whether more binding regimes are socially beneficial. While binding Say on Pay in my model always benefits the shareholders, it may reduce the expected payoffs to other parties by a greater amount, thereby reducing social welfare. One limitation of the model is the discrete nature of CEO effort, which short-circuits additional welfare effects through greater CEO equity.
Appendix

Proof of Proposition 1. In the benchmark, the shareholders’ expected payoff under perfect communication and babbling, respectively, is given by:

\[
EU^s_{\text{SH}}(\alpha^s_B, \alpha^s_C, b) = (1 - \alpha^s_B)(1 - \alpha^s_C) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - \left( 1 - \frac{\alpha^s_B(1 - \alpha^s_C)\Lambda_s}{2c} \right) \frac{\Lambda_s}{2} \right],
\]

\[
EU^\emptyset_{\text{SH}}(\alpha^\emptyset_B, \alpha^\emptyset_C, b) = (1 - \alpha^\emptyset_B)(1 - \alpha^\emptyset_C) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - \left( 1 - \frac{\alpha^\emptyset_B(1 - \alpha^\emptyset_C)\Lambda_\emptyset}{2c} \right) \frac{\Lambda_\emptyset}{2} \right].
\]

Note that for \( b \leq b = \frac{\Delta^2}{2m} \), communication comes for free because the effort CEO equity stake is enough for perfect communication to ensue, i.e., babbling is not feasible. For \( b > b \), the shareholders compare the respective expected payoffs under perfect communication and babbling; the difference is defined as

\[
D_{\text{SH}}(b) \equiv EU^s_{\text{SH}}(\alpha^s_B, \alpha^s_C, b) - EU^\emptyset_{\text{SH}}(\alpha^\emptyset_B, \alpha^\emptyset_C, b).
\]

If the shareholders induce perfect communication, they will choose \( \alpha^s_C = \hat{\alpha}_C(b) = \frac{b}{2} \). I now show that the shareholders’ payoff under perfect communication is decreasing in \( b \) by the Envelope Theorem,

\[
\frac{dEU^s_{\text{SH}}(\alpha^s_B, \alpha^s_C, b)}{db} = \frac{\partial EU^s_{\text{SH}}(\alpha^s_B, \alpha^s_C, b)}{\partial \alpha^s_C} \cdot \frac{d\alpha^s_C(b)}{db}
= -(1 - \alpha^s_B) \left[ m + \frac{H^2 + L^2}{4} - \left( 1 - \frac{\alpha^s_B(1 - \alpha^s_C)\Lambda_s}{2c} \right) \frac{\Lambda_s}{2} + \left( 1 - \alpha^s_C \right) \frac{\alpha^s_B \Lambda_s^2}{4c} \right] \cdot \frac{1}{m} < 0.
\]

At the same time, to induce babbling, \( \alpha^\emptyset_C = \alpha_C = \frac{1}{m} \), hence \( EU^\emptyset_{\text{SH}}(\alpha^\emptyset_B, \alpha^\emptyset_C, b) \) is constant in \( b \), so it follows that \( D_{\text{SH}}(b) \) is decreasing in \( b \),

\[
\frac{dD_{\text{SH}}(b)}{db} = \frac{dEU^s_{\text{SH}}(\alpha^s_B, \alpha^s_C, b)}{db} - \frac{dEU^\emptyset_{\text{SH}}(\alpha^\emptyset_B, \alpha^\emptyset_C, b)}{db} < 0.
\]
For very low $c$, an uninteresting case may arise that shareholders never grant higher CEO equity stake than the CEO effort equity stake to induce perfect communication, i.e., $D_{SH}(b) < 0$ for all $b$, consequently $\alpha_C = \alpha_C = \frac{1}{m}$ always. 

To focus on the interesting case, from now on I assume $c > \zeta \equiv \frac{\Lambda_\emptyset - \Lambda_s}{4} \left( 1 - \frac{1}{m} \right) \left( m + \frac{H^2 + L^2}{4} - \frac{\Lambda_s}{2} - \frac{H^2 + L^2}{4} - \frac{\Lambda_\emptyset}{2} \right)$.

Hence there exists a cutoff $b_0 > b$, such that $D_{SH}(b) > 0$ for $b < b_0$, and $D_{SH}(b) < 0$ for $b > b_0$, i.e., the communication case in the benchmark is perfect communication for $b \leq b_0$, and babbling for $b > b_0$. To be specific, $b = b_0$ is defined as the benchmark cutoff between perfect communication and babbling, formally $EU_{SH}^s(\alpha_B^s, \alpha_C^s, b_0) \equiv EU_{SH}^\emptyset(\alpha_B^\emptyset, \alpha_C^\emptyset, b_0)$.

For notational simplicity, I henceforth suppress $b$ in $\alpha_C^s(b)$, $\alpha_B^s(b)$, $EU_B^s(b)$, $EU_{SH}^s(b)$, $EV^s(b)$, and $e^s(b)$ unless otherwise noted. For later use, for $j \in \{s, \emptyset\}$, the firm value in (6) factoring in optimal board effort in (10) and the board equity stake $\alpha_j^j$ followed from (11) can be restated as:

$$EV^j = m + \frac{1}{2} E[\omega]^2 - \left( 1 - \frac{\alpha_B^j(1 - \alpha_C^j)\Lambda_j}{2c} \right) \Lambda_j = (1 - \alpha_B^j)(1 - \alpha_C^j) \frac{\Lambda_j^2}{4c}.$$  (14)

Similarly, using (11), the following term can be restated as:

$$m + \frac{1}{2} E[\omega]^2 - \frac{\Lambda_j}{2} = (1 - 2\alpha_B^j)(1 - \alpha_C^j) \frac{\Lambda_j^2}{4c}.$$  (15)

Therefore using (14), (15) the case-wise shareholders’ expected payoffs can be restated as:

$$EU_{SH}^s(\alpha_B^s, \alpha_C^s, b) = [(1 - \alpha_B^s)(1 - \alpha_C^s)]^2 \frac{\Lambda_s^2}{4c};$$  (16)

$$EU_{SH}^\emptyset(\alpha_B^\emptyset, \alpha_C^\emptyset, b) = [(1 - \alpha_B^\emptyset)(1 - \alpha_C^\emptyset)]^2 \frac{\Lambda_\emptyset^2}{4c}.$$  (17)

By definition of $b_0$, $EU_{SH}^s(\alpha_B^s, \alpha_C^s, b_0) = EU_{SH}^\emptyset(\alpha_B^\emptyset, \alpha_C^\emptyset, b_0)$; the shareholders indifferent condition is obtained by equating (16) with (17), which will be used
later,
\[ \frac{\Lambda_s^2}{4c} = \frac{[(1 - \alpha_B^\theta)(1 - \alpha_C^\theta)]^2}{[(1 - \alpha_B^s)(1 - \alpha_C^s)]^2} \cdot \frac{\Lambda_\emptyset^2}{4c}. \] (18)

**Proof of Lemma** Suppose the shareholders prefer perfect communication for some \( b \) and given the board contract conditional on perfect communication \( \alpha_B^s(b) \). I now show that the board will not have any incentive to deviate to babbling, because by deviating the board secures lower compensation (same equity stake but lower expected firm value) and incurs higher effort cost. If the shareholders prefer perfect communication and the board induces perfect communication, the board’s expected payoff is
\[
EU_B^s(\alpha_B^s, \alpha_C^s, b) = \alpha_B^s(1 - \alpha_C^s) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - (1 - e^s(\alpha_B^s, \alpha_C^s)) \frac{\Lambda_s}{2} \right] - \frac{c(e^s(\alpha_B^s, \alpha_C^s))^2}{2}.
\]
If however the board deviates from perfect communication to babbling, by lowering the CEO’s equity stake from \( \alpha_C^s = \hat{\alpha}_C(b) \) to \( \alpha_C^\emptyset = \underline{\alpha}_C \), the board’s expected payoff is
\[
EU_B^\emptyset(\alpha_B^s, \alpha_C^\emptyset, b) = \alpha_B^s(1 - \alpha_C^\emptyset) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - (1 - e^\emptyset(\alpha_B^s, \alpha_C^\emptyset)) \frac{\Lambda^\emptyset}{2} \right] - \frac{c(e^\emptyset(\alpha_B^s, \alpha_C^\emptyset))^2}{2}.
\]
If the shareholders prefer perfect communication to babbling, by revealed preference,
\[
EU_{SH}^s(\alpha_B^s, \alpha_C^s, b) = (1 - \alpha_B^s)(1 - \alpha_C^s) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - (1 - e^s(\alpha_B^s, \alpha_C^s)) \frac{\Lambda_s}{2} \right] \\
\geq EU_{SH}^\emptyset(\alpha_B^\emptyset, \alpha_C^\emptyset, b) \\
= (1 - \alpha_B^\emptyset)(1 - \alpha_C^\emptyset) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - (1 - e^\emptyset(\alpha_B^\emptyset, \alpha_C^\emptyset)) \frac{\Lambda^\emptyset}{2} \right] \\
r.p. \geq (1 - \alpha_C^s)(1 - \alpha_C^\emptyset) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - (1 - e^\emptyset(\alpha_B^s, \alpha_C^\emptyset)) \frac{\Lambda^\emptyset}{2} \right].
\]
It follows that
\[
(1 - \alpha_C^s) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - (1 - e^s(\alpha_B^s, \alpha_C^s)) \frac{\Lambda_s}{2} \right] \\
\geq (1 - \alpha_C^\emptyset) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - (1 - e^\emptyset(\alpha_B^s, \alpha_C^\emptyset)) \frac{\Lambda^\emptyset}{2} \right],
\]
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and the board bears higher effort cost under babbling since \( e^s(\alpha^s_B, \alpha^s_C) < e^\emptyset(\alpha^\emptyset_B, \alpha^\emptyset_C) \).

Therefore \( EU^*_B(\alpha^s_B, \alpha^s_C) > EU^\emptyset_B(\alpha^s_B, \alpha^\emptyset_C) \), i.e., the board does not have incentive to deviate from perfect communication to babbling if the shareholders prefer perfect communication to babbling.

**Proof of Lemma 2.** I now show that \( D_B(\alpha^\emptyset_B, b_0) > 0 \). As defined in (13), given board equity stake \( \alpha_B \), the difference of board payoff under perfect communication and babbling is

\[
D_B(\alpha_B, b) = EU^*_B(\alpha^s_C | \alpha_B, b) - EU^\emptyset_B(\alpha^\emptyset_C | \alpha_B, b).
\]

Define \( b = \hat{b} \) as the cutoff when the board is just indifferent between deviating to perfect communication and staying in babbling given the naive shareholders have chosen the board’s equity stake \( \alpha^\emptyset_B \) as in the benchmark, formally, \( D_B(\alpha^\emptyset_B, \hat{b}) \equiv 0 \).

Given \( \alpha^s_B \), if the board induces perfect communication by choosing \( \alpha^s_C = \alpha^s_C(b) \), using (14),(15) the board’s payoff can be restated as follows,

\[
EU^*_B(\alpha^s_C | \alpha^s_B, b) = \alpha_B^s(1 - \alpha^s_C) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - (1 - e^s(\alpha^s_C, \alpha^s_B)) \frac{\Lambda^s}{2} \right] - \frac{c(\alpha^s_C, \alpha^s_B)^2}{2}.
\]

Given \( \alpha^s_B \), if the board induces babbling by choosing \( \alpha^s_C = \alpha^\emptyset_C \), the board’s payoff:

\[
EU^\emptyset_B(\alpha^\emptyset_C | \alpha^s_B, b) = \alpha_B^\emptyset(1 - \alpha_C^\emptyset) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - (1 - e^\emptyset(\alpha^\emptyset_C, \alpha^\emptyset_B)) \frac{\Lambda^\emptyset}{2} \right] - \frac{c(\alpha^\emptyset_C, \alpha^\emptyset_B)^2}{2}.
\]

Given \( \alpha^\emptyset_B \), if the board induces babbling by choosing \( \alpha_C = \alpha^\emptyset_C \), the board’s payoff:

\[
EU^\emptyset_B(\alpha^\emptyset_C | \alpha^\emptyset_B, b) = \alpha_B^\emptyset(1 - \alpha_C^\emptyset) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - (1 - e^\emptyset(\alpha^\emptyset_C, \alpha^\emptyset_B)) \frac{\Lambda^\emptyset}{2} \right] - \frac{c(\alpha^\emptyset_C, \alpha^\emptyset_B)^2}{2}.
\]

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Given $\alpha^0_B$, if the board induces perfect communication by choosing $\alpha_C = \alpha^*_C(b)$, the board’s payoff:

$$EU^*_B(\alpha^*_C|\alpha^0_B, b) = \alpha^0_B(1 - \alpha^*_C) \left[ m + \frac{1}{2}E[\omega]^2 - (1 - e^*(\alpha^0_B, \alpha^*_C))\frac{\Lambda_s}{2} \right] - c\left(e^*(\alpha^0_B, \alpha^*_C)\right)^2$$

$$= \left[ \alpha^0_B(1 - 2\alpha^*_B) + \frac{1}{2}(\alpha^0_B)^2 \right] (1 - \alpha^*_B)^2 \frac{\Lambda_s^2}{4c}. \quad (22)$$

Using the board’s payoffs stated in (21) and (22) and the shareholders indifferent condition (18), the board’s deviation gain from babbling to perfect communication, given $\alpha^0_B$ at the benchmark cutoff $b_0 + \epsilon$, $\epsilon \rightarrow 0^+$, is as follows:

$$D_B(\alpha^0_B, b_0) = EU^*_B (\alpha^*_C(b_0) | \alpha^0_B, b_0) - EU^*_B (\alpha^*_C | \alpha^0_B, b_0)$$

At $b = b_0$, by definition, shareholders are indifferent between perfect communication and babbling. Using the shareholders indifferent condition (18), $D_B(\alpha^0_B, b_0)$ can be restated as

$$D_B(\alpha^0_B, b_0) = \alpha^0_B(1 - \alpha^*_C)^2 \frac{\Lambda_0^2}{4c} \left[ (1 - 2\alpha^*_B + \frac{\alpha^0_B}{2}) \frac{(1 - \alpha^*_B)^2}{(1 - \alpha^*_B)^2} - \left(1 - \frac{3\alpha^0_B}{2}\right) \right],$$

treating $D_B(\alpha^0_B, b_0)$ as a function of $\alpha^*_B$, and take first-order derivative of $D_B(\alpha^0_B, b_0)$ with respect to $\alpha^*_B$,

$$\frac{dD_B(\alpha^0_B, b_0)}{d\alpha^*_B} = \alpha^0_B(1 - \alpha^*_C)^2 \frac{\Lambda_0^2}{4c} \cdot \frac{2(\frac{\alpha^0_B}{2} - \alpha^*_B)(1 - \alpha^*_B)}{(1 - \alpha^*_B)^4},$$

note that $\frac{dD_B(\alpha^0_B, b_0)}{d\alpha^*_B} > 0$ for $\alpha^*_B < \frac{1}{2}\alpha^0_B$ and $\frac{dD_B(\alpha^0_B, b_0)}{d\alpha^*_B} < 0$ for $\alpha^*_B > \frac{1}{2}\alpha^0_B$, i.e. $D_B(\alpha^0_B, b_0)$ is single-peaked in $\alpha^*_B$, therefore it’s sufficient to check the boundaries. Since $\alpha^*_C \geq \alpha^0_C$, and $\Lambda_s < \Lambda_0$, $\alpha^*_B > 0$, therefore

$$0 < \alpha^*_B < \alpha^0_B. \quad (23)$$

Note that

$$D_B(\alpha^0_B, b_0) |_{\alpha^*_B=0} = \alpha^0_B(1 - \alpha^0_C)^2 \frac{\Lambda_0^2}{4c} \left[ \left(1 + \frac{\alpha^0_B}{2}\right)(1 - \alpha^0_B)^2 - \left(1 - \frac{3\alpha^0_B}{2}\right) \right]$$

$$= \alpha^0_B(1 - \alpha^0_C)^2 \frac{\Lambda_0^2}{4c} \left[ \frac{(\alpha^0_B)^3}{2} \right]$$

$$> 0,$$
and \( D_B(\alpha_B^0, b_0) \mid_{\alpha_B^0 = \alpha_B} = 0 \). Therefore

\[
D_B(\alpha_B^0, b_0) = EU_B^s (\alpha_C^s \mid \alpha_B^0, b_0) - EU_B^\emptyset (\alpha_C^\emptyset \mid \alpha_B^0, b_0) > 0,
\]

and

\[
\frac{dD_B(\alpha_B^0, b)}{db} = \frac{dD_B(\alpha_B^0, b)}{d\alpha_C^s} \cdot \frac{d\alpha_C^s}{db} < 0, \quad (24)
\]

and at \( b = \hat{b} \) by definition \( D_B(\alpha_B^0, \hat{b}) = 0 \), it follows that \( \hat{b} > b_0 \).

**Proof of Lemma 3.** If \( b \in (b, b_0) \), the communication case in the benchmark and the main setting is both perfect communication, \( IC_B^s \) is slack by Lemma 1, therefore the main setting is the same as the benchmark.

If \( b > \hat{b} \), the communication case in the benchmark and the main setting is both babbling. As shown in (24) the deviation gain of the board, \( D_B(\alpha_B^0, b) \), decreases in the CEO bias \( b \) and \( D_B(\alpha_B^0, \hat{b}) \equiv 0 \), which means \( D_B(\alpha_B^0, b > \hat{b}) < 0 \), i.e. \( IC_B^\emptyset \) is slack, therefore the main setting is the same as the benchmark.

**Proof of Lemma 4.** I now show that \( D_B^\emptyset(b_0) - D_B^s(b_0) > 0 \) in two steps. Step 1 simplifies the term \( D_B^\emptyset(b_0) - D_B^s(b_0) \) and Step 2 shows that \( D_B^\emptyset(b_0) - D_B^s(b_0) \) decreases in \( \alpha_C^s \).

Step 1: simplify the term \( D_B^\emptyset(b_0) - D_B^s(b_0) \).

Define the difference of payoff to the board under perfect communication and babbling given the benchmark contract as

\[
D_B^s(b) \equiv D_B(\alpha_B^s(b), b),
\]

\[
D_B^\emptyset(b) \equiv D_B(\alpha_B^\emptyset, b).
\]

(25)

Using (19), (20), (21), (22), and the fact that shareholders are indifferent at the benchmark cutoff \( b_0 \) from (18).

\[
D_B^s(b_0) = \alpha_B^s(1 - \alpha_C^s)^2 \frac{A_0^2}{4c} \left[ \left(1 - 3\alpha_B^s\right) \left(1 - \alpha_B^\emptyset\right)^2 - \left(1 - 2\alpha_B^\emptyset + \frac{1}{2}\alpha_B^s\right)\right],
\]

\[
D_B^\emptyset(b_0) = \alpha_B^\emptyset(1 - \alpha_C^\emptyset)^2 \frac{A_0^2}{4c} \left[ \left(1 - 2\alpha_B^s + \frac{\alpha_B^\emptyset}{2}\right) \left(1 - \alpha_B^\emptyset\right)^2 - \left(1 - \frac{3\alpha_B^\emptyset}{2}\right)\right].
\]

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Subtract $D_B^\emptyset(b_0)$ from $D_B^\emptyset(b_0)$ and rearrange and it follows that,

$$D_B^\emptyset(b_0) - D_B^s(b_0) = (1 - \alpha_B^\emptyset)^2(1 - \alpha_B^s) \left[ \frac{1}{4} \left( 1 - 2\alpha_B^\emptyset + \frac{\alpha_B^\emptyset}{2} \right) \right]$$

$$\left( 1 - \frac{(1 - \alpha_B^\emptyset)^2}{2} - \alpha_B^\emptyset \left( 1 - \frac{3\alpha_B^\emptyset}{2} \right) \right)$$

Step 2: I show that $D_B^\emptyset(b_0) - D_B^s(b_0)$ decreases in $\alpha_B^s$.

$$\frac{d(D_B^\emptyset(b_0) - D_B^s(b_0))}{d\alpha_B^s} = \frac{(1 - \alpha_B^\emptyset)^2(1 - \alpha_B^s) \left[ (\alpha_B^\emptyset)^2 - 2\alpha_B^s\alpha_B^\emptyset + 2\alpha_B^s - 1 \right]}{(1 - \alpha_B^s)^4}$$

$$+ (1 - 2\alpha_B^\emptyset + \alpha_B^s)$$

$$= \frac{(1 - \alpha_B^\emptyset)^2(1 - \alpha_B^s)(1 - \alpha_B^\emptyset)(2\alpha_B^s - \alpha_B^\emptyset - 1)}{(1 - \alpha_B^s)^4}$$

$$+ (1 - 2\alpha_B^\emptyset + \alpha_B^s).$$

As $\alpha_B^\emptyset > \alpha_B^s$ from (23), it follows that $1 - \alpha_B^\emptyset < 1 - \alpha_B^s$, hence

$$\frac{d(D_B^\emptyset(b_0) - D_B^s(b_0))}{d\alpha_B^s} \leq (2\alpha_B^s - \alpha_B^\emptyset - 1) + (1 - 2\alpha_B^\emptyset + \alpha_B^s)$$

$$= 3\alpha_B^s - 3\alpha_B^\emptyset$$

$$< 0.$$

Since $D_B^\emptyset(b_0) - D_B^s(b_0)$ is decreasing in $\alpha_B^s$, and $\alpha_B^s < \alpha_B^\emptyset$ from (23),

$$(D_B^\emptyset(b_0) - D_B^s(b_0))|_{\alpha_B=\alpha_B^\emptyset} = 0.$$

Therefore $D_B^\emptyset(b_0) - D_B^s(b_0) > 0$.

**Proof of Proposition 2.** I assume $b \in B \equiv (b_0, \hat{b})$ throughout this proof. Step 1 shows that if the shareholders choose to induce babbling when $b \in B$, the shareholders will choose $\hat{\alpha}_B(b)$ to make the babbling constraint just binding. Step 2 shows that $\hat{\alpha}_B(b)$ is decreasing in $b$, and Step 3 shows $EU_{SH}(\hat{\alpha}_B(b), b)$ is increasing in $b$. Finally Step 4 shows that there exists a cutoff of CEO bias in
the main setting such that the shareholders are again indifferent between perfect communication and babbling.

Step 1: To induce babbling, the shareholders choose \( \alpha_B = \hat{\alpha}_B(b) \) to make the babbling constraint just binding.

In the benchmark, at \( b = b_0 + \epsilon, \epsilon \to 0^+ \), the shareholders choose \( \alpha^*_B = \alpha_0^B \) to induce babbling. However in the main setting this violates the board’s babbling constraint by Lemma 2. Therefore the shareholders have to offer a higher \( \alpha^*_B \) to induce babbling. Recall that \( \hat{\alpha}_B(b) \) is defined by

\[
\hat{\alpha}_B(b) = \frac{(1 - \alpha^*_C(b)) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - \frac{\Lambda^2}{2} \right] - (1 - \alpha^0_C) \left[ m + \frac{1}{2} \mathbb{E}[\omega]^2 - \frac{\Lambda^2}{2} \right]}{(1 - \alpha^*_C(b))^2 \Lambda^2}.
\] (26)

It can be shown that \( \hat{\alpha}_B(b) \) decreases in \( b \):

\[
\frac{d\hat{\alpha}_B(b)}{db} = \frac{\partial \hat{\alpha}_B(b)}{\partial \alpha^*_C(b)} \cdot \frac{d\alpha^*_C(b)}{db} < 0.
\] (27)

and \( b_0 < \hat{b}, \) therefore \( \hat{\alpha}_B(b) > \alpha_0^B \equiv \hat{\alpha}_B(\hat{b}) \). Given the first-order condition and the second-order condition:

\[
\frac{\partial EU^0_{SH}}{\partial \alpha_B} |_{\alpha_B = \alpha_0^B} = 0, \quad \frac{\partial^2 EU^0_{SH}}{\partial \alpha_B^2} = -\frac{(1 - \alpha^0_C)^2 \Lambda^2}{c} < 0,
\]

it follows that \( \frac{\partial EU^0_{SH}}{\partial \alpha_B} |_{\alpha_B > \alpha_0^B} < 0 \), and the shareholders will choose \( \alpha_B = \hat{\alpha}_B(b) \) to induce babbling in the main setting.

Step 2: \( EU^0_{SH}(\hat{\alpha}_B(b), b) \) is strictly increasing in \( b \) for \( b \in B \).

\[
\frac{dEU^0_{SH}(\hat{\alpha}_B(b), b)}{db} = \frac{\partial EU^0_{SH}(\hat{\alpha}_B(b), b)}{\partial \hat{\alpha}_B(b)} \cdot \frac{\hat{\alpha}_B(b)}{db} > 0.
\]

(28)

Note that as the CEO bias \( b \) goes up, \( \alpha^*_C(b) \) goes up and the shadow cost of the babbling constraint decreases.

Step 3: \( EU^0_{SH}(\alpha^*_B, \alpha^*_C, b) \) is strictly decreasing in \( b \).
If perfect communication ensues, the CEO bias \( b \) affects the shareholders’ expected payoff only through \( \alpha^*_C(b) \). The shareholders’ expected payoff decreases with the dilution from the CEO equity stake \( \alpha^*_C(b) \), which increases with the CEO bias. Therefore \( EU_{SH}^s(\alpha^*_B, \alpha^*_C, b) \) decreases in \( b \).

Step 4: For \( b \in B \), the shareholders compare the payoffs under perfect communication and babbling, the difference is

\[
D_{SH}(b) \equiv EU_{SH}^s(\alpha^*_B, \alpha^*_C, b) - EU_{SH}^\emptyset(\alpha^\emptyset_B, \alpha^\emptyset_C, b).
\]

\[
\frac{dD_{SH}(b)}{db} = \frac{dEU_{SH}^s(b \mid b \in B)}{db} - \frac{dEU_{SH}^\emptyset(b \mid b \in B)}{db} < 0.
\]

Therefore there exists \( b_{00} \) such that \( D_{SH}(b) > 0 \) for \( b < b_{00}, \) and \( D_{SH}(b) < 0 \) for \( b > b_{00}, \) i.e. the communication case is perfect communication for \( b \leq b_{00}, \) and babbling for \( b > b_{00}. \) To be specific, \( b = b_{00} \) is defined as main setting cut-off between perfect communication and babbling, that is when the shareholders choose \( \alpha_B, \) and the board chooses \( \alpha_C, \) the indifferent point of the shareholders between perfect communication and babbling, formally \( EU_{SH}^s(\alpha^*_B(b_{00}), \alpha^*_C(b_{00})) \equiv EU_{SH}^\emptyset(\alpha_B(b_{00}), \alpha_C^\emptyset). \)

**Proof of Corollary 1** For \( b \in (b_0, b_{00}), \) the communication case is babbling in the benchmark and perfect communication in the main setting. \( \alpha^*_C = \alpha^\emptyset_C = \frac{1}{m}, \)

\( \alpha^*_C = \alpha^\emptyset_C = \frac{b}{2}. \) Therefore \( \alpha^{**}_C > \alpha^*_C. \) The equilibrium board’s equity stake in the benchmark and the main setting:

\[
\alpha^*_B = \alpha^\emptyset_B = \frac{1}{2} - \frac{m + \frac{1}{2}[\omega]^2 - \frac{\Lambda^\emptyset}{2}}{(1 - \alpha^\emptyset_C) \frac{\Lambda^\emptyset}{2c}},
\]

\[
\alpha^{**}_B = \alpha^*_B = \frac{1}{2} - \frac{m + \frac{1}{2}[\omega]^2 - \frac{\Lambda^*_C}{2}}{(1 - \alpha^*_C) \frac{\Lambda^*_C}{2c}}.
\]

From (23), \( \alpha^*_B < \alpha^\emptyset_B, \) and it follows that \( \alpha^{**}_B < \alpha^*_B. \)

For \( b \in (b_{00}, \hat{b}), \) the communication case for both the benchmark and the main setting is babbling. The difference is in the benchmark the shareholders solve

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the unconstrained problem and can choose interior $\alpha_B^0$. However, in the main setting $IC_B^0$ is binding, and the shareholders have to choose a higher board’s equity stake $\hat{\alpha}_B(b)$ as in \textcolor{red}{[26]} to ensure the board does not deviate to perfect communication:

$$
\alpha_B^* = \alpha_B^0 = \frac{1}{2} - \frac{m + \frac{1}{2} E[\omega]^2 - \Lambda_0}{(1 - \alpha_B^0)(\Lambda_0^2/2c)},
\alpha_B^{**} = \hat{\alpha}_B(b).
$$

Since $\hat{\alpha}_B(b)$ is decreasing in $b$ from \textcolor{red}{[27]}, and $\hat{\alpha}_B(b = \hat{b}) \equiv \alpha_B^0 = \alpha_B^*$, it follows that $\alpha_B^{**} > \alpha_B^*$ for $b \in (b_0, \hat{b})$.

**Proof of Proposition 3.** This proof of comparison of the board’s expected payoff consists of two parts. Part (i) is for the case where the shareholders acquiesce to perfect communication; part (ii) is for the case where the shareholders preempt communication.

Part (i): For $b \in (b_0, b_{00})$, the communication case is babbling in the benchmark and perfect communication in the main setting of board discretion. To show that $EU_B^{**} < EU_B^*$, first show that $EU_B^*$ jumps up at $b_0$, then show that $EU_B^{**}$ decreases in $b$ for $b \in (b_0, b_{00})$.

Step 1: $EU_B^*$ jumps up at $b_0$.

The board’s expected payoffs in the benchmark and the main setting read

$$
EU_B^* = \alpha_B^*(1 - \alpha_C^*) \left[ m + \frac{1}{2} E[\omega]^2 - (1 - e^*) \frac{\Lambda_0}{2} \right] - \frac{c(e^*)^2}{2},
$$

$$
EU_B^{**} = \alpha_B^{**}(1 - \alpha_C^{**}) \left[ m + \frac{1}{2} E[\omega]^2 - (1 - e^{**}) \frac{\Lambda_s}{2} \right] - \frac{c(e^{**})^2}{2}.
$$

Rewrite the expected payoffs of the shareholders and the board in the benchmark using \textcolor{red}{[16]}, \textcolor{red}{[17]}, \textcolor{red}{[21]} and \textcolor{red}{[19]}, and at $b = b_0$, the shareholders are indifferent between perfect communication and babbling, i.e., $EU_{SH}^s(b_0) = EU_{SH}^0$, applying the indifferent condition \textcolor{red}{[18]} and get

$$
EU_B^s = \alpha_B^s(1 - \alpha_C^s)^2 \left( 1 - 3\alpha_B^s \frac{\Lambda_0^2}{4c} \right) \frac{\Lambda_s^2}{4c} = \alpha_B^s \left( 1 - 3\alpha_B^s \frac{\Lambda_0^2}{4c} \right) \left[ \frac{(1 - \alpha_B^0)(1 - \alpha_B^0)}{(1 - \alpha_B^0)^2} \right] \frac{\Lambda_0^2}{4c}.
$$
For given $b$, denote the difference of the board’s expected payoffs in equilibrium under perfect communication and babbling by $G_B(b) \equiv EU_B^s(b) - EU_B^\emptyset$, at $b = b_0,$

$$G_B(b_0) \equiv EU_B^s(b_0) - EU_B^\emptyset = \frac{\alpha_B^s(1 - \frac{3\alpha_B^s}{2})}{(1 - \alpha_B^s)^2}[(1 - \alpha_B^\emptyset)(1 - \alpha_C^\emptyset)]^2 \frac{\Lambda_B^2}{4c} - \alpha_B^\emptyset(1 - \alpha_C^\emptyset)^2 \left(1 - \frac{3\alpha_B^\emptyset}{2}\right) \frac{\Lambda_B^2}{4c}

= (1 - \alpha_C^\emptyset)^2 \frac{\Lambda_B^2}{4c} \left[\alpha_B^s(1 - \frac{3\alpha_B^s}{2})(1 - \alpha_B^\emptyset)^2 - \alpha_B^\emptyset(1 - \frac{3\alpha_B^\emptyset}{2})\right].$$

$$\frac{dG_B(b_0)}{d\alpha_B^s} = (1 - \alpha_C^\emptyset)^2 \frac{\Lambda_B^2}{4c} (1 - \alpha_B^\emptyset)^2 \left[\frac{(1 - \alpha_B^\emptyset)(1 - 2\alpha_B^s)}{(1 - \alpha_B^s)^4}\right] > 0.$$ 

From (23), $0 < \alpha_B^s < \alpha_B^\emptyset$, and

$G_B(b_0)\mid_{\alpha_B^s=0} < 0,$

$G_B(b_0)\mid_{\alpha_B^s=\alpha_B^\emptyset} = 0,$

it follows that $G_B(b_0) < 0$. Therefore $\lim_{b \to b_0^-} EU_B^s = EU_B^\emptyset(b_0) < EU_B^\emptyset = \lim_{b \to b_0^+} EU_B^s$, that is $EU_B^s$ jumps up at $b_0$.

Step 2: $EU_B^{**}$ decreases in $b$ for $b \in (b_0, b_{00})$.

$$\frac{dEU_B^s}{db} = \frac{d[\alpha_B^s(1 - \alpha_C^\emptyset)]}{db} \left[m + \frac{1}{2} E[\omega]^2 - (1 - e^s) \frac{\Lambda_s}{2}\right]$$

$$\propto \frac{d[\alpha_B^s(1 - \alpha_C^\emptyset)]}{db}$$

$$= \frac{d}{db} \left[\frac{1}{2} \left(1 - \frac{b}{\Lambda}\right) - \frac{m + \frac{H^2 + L^2}{4} - \frac{\Lambda}{2}}{\frac{\Lambda^2}{4c}}\right] < 0.$$ 

Therefore for $b \in (b_0, b_{00})$, $EU_B^{**} = EU_B^s < EU_B^s(b_0) < EU_B^\emptyset = EU_B^*.$

Part (ii) : On the other hand, for $b \in (b_{00}, \hat{b})$, the communication for benchmark and main setting is both babbling, with the difference in board equity stake to induce babbling.

$$EU_B^* = EU_B^\emptyset(\alpha_B^\emptyset),$$

$$EU_B^{**} = EU_B^\emptyset(\alpha_B^\emptyset).$$
The board’s expected utility increases with its equity stake:

\[
\frac{dE_U^0_B}{d\alpha_B} = (1 - \alpha_C^0) \left[ m + \frac{1}{2}E[\omega]^2 - (1 - e^0) \Lambda_B \right] > 0,
\]

recall that for \( b \in (b_00, \hat{b}) \), \( \alpha^{**}_B = \hat{\alpha}_B(b) > \alpha_B^0 = \alpha^*_B \), therefore

\[
EU^{**}_B = EU^0_B(\hat{\alpha}_B(b)) > EU^0_B(\alpha_B^0) = EU^*_B.
\]

**Proof of Corollary 3.** As in (7), the CEO’s expected payoff is

\[
EU_C(\cdot) = \alpha_C \left[ m + \frac{1}{2}E[\omega]^2 - (1 - e) \Lambda_C \frac{1}{2} \right] + bE[y] - 1.
\]

For \( b \in (b_00, \hat{b}) \), the communication cases for the benchmark and the main setting are both babbling, therefore \( \alpha^{**}_C = \alpha^*_C = \alpha_C \). The board effort is higher than benchmark because \( \alpha^{**}_B > \alpha^*_B \) from Corollary 1. \( E[y] = \frac{H+L}{2} \) for both settings. It follows that \( EU^{**}_C > EU^*_C \).

**Proof of Corollary 4.** Again, for \( b \in (b_00, \hat{b}) \), the communication cases in the benchmark and babbling are both babbling,

\[
W(e, b) = EV(\cdot) + bE[y] - C(e) - G(a) - \left[ m + \frac{1}{2}E[\omega]^2 - (1 - e) \Lambda(\alpha_C, b) \right] - ce^2 \frac{1}{2} + bE[y] - 1.
\]

Taking first-order derivative with respect to the board effort, using the optimal effort as in (10),

\[
\frac{dW(e, b)}{de} = \Lambda(\cdot) \frac{1}{2} - ce = \frac{\Lambda(\cdot)}{2} - \alpha_B(1 - \alpha_C)\Lambda(\cdot) > 0.
\]

In this region \( e^{**} > e^* \), followed from \( \alpha^{**}_B > \alpha^*_B \) in Corollary 1 therefore it follows that \( W^{**} > W^* \).
References


