

## Board independence and CEO pay

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### Abstract

This paper presents a model where a board of directors not completely independent from the CEO set the CEO's pay. We show that the board's monitoring intensity and the equilibrium pay-performance sensitivity of CEO's pay are increasing in the board's independence.

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### 1. Introduction

The optimal contracting view of executive compensation recognizes that managers suffer from an agency problem and do not automatically seek to maximize shareholder value. In this commonly accepted view, the board of directors, working in shareholders' interest, provides the correct incentives to the manager by way of designing managerial compensation.<sup>1</sup> As pointed out by [Bebchuk and Fried \(2003\)](#), however, there is no reason to expect a priori that the board will seek to maximize shareholder value. In reality, the CEOs play an important role in renominating directors to the board (see [Shivdasani and Yermack \(1999\)](#)). Due to the CEO's influence over the board, directors might as well have an incentive to go along with the CEO's pay arrangement. As argued by [Hermalin and Weisbach \(1998\)](#), directors who value the opportunity to serve in other boards could have an

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<sup>1</sup> For a recent comprehensive survey of executive compensation literature, see [Core et al. \(2003\)](#).

incentive to establish a reputation for ‘not rocking the boat’, i.e., for not intensely confronting the CEO, simply because the CEO can affect their compensation and perks. These considerations call for a theoretical analysis of the implications of the lack of board independence on managerial incentive contracting.

This paper presents a simple model of CEO compensation where a board of directors which benefits from the CEO’s perks (and hence is dependent on the CEO) sets CEO pay. We analyze an agency problem where a CEO with an unknown ability is hired by the board to run a firm. The firm’s final value depends on CEO’s ability, CEO’s unobservable effort and some firm level risk factor. Upon hiring the CEO, the board gathers information on CEO’s ability and uses this information to design the CEO’s incentive compensation. The CEO then allocates the company resources between projects that maximize shareholder value and those projects which create benefits (perks) only for himself/herself and possibly for the board. We refer to the extent that the board derives utility from CEO’s perks as the degree of the board’s lack of independence. Since the board also benefits from CEO’s perks, its incentives in gathering information (monitoring) and setting incentive pay are not aligned with the shareholders.

We find that the board’s monitoring intensity and the equilibrium pay-performance sensitivity of CEO’s pay are increasing in board’s independence from the CEO. These predictions are supported by the empirical results of [Mehran \(1995\)](#), [Bertrand and Mullainathan \(2000\)](#) and [Hartzell and Starks \(2003\)](#). [Mehran \(1995\)](#) empirically shows that as the proportion of executive directors in the board increases (i.e., as board independence decreases), the board grants the CEO less incentive-based pay. [Bertrand and Mullainathan \(2000\)](#) finds that the sensitivity of pay to performance is higher in better governed firms with a large shareholder present. They argue that “...when governance is good, such as when there is a large shareholder present, the board may make sure that the pay-package looks optimal from the shareholders’ perspective. When governance is weak, the board may be much more willing to cater to the CEO.” In the context of our model, a better governed firm corresponds to the one with a board less dependent on the CEO. [Hartzell and Starks \(2003\)](#) also empirically link the presence of strong institutional investor in the board to CEO’s pay-performance sensitivity and report a positive relationship between the two. Their findings also fully support our theoretical predictions. Our paper fills in the theoretical gap and links board independence to the structure of executive pay.<sup>2</sup>

The plan of the paper is as follows: the next section describes the model. Section 3 presents the analysis and the results. Section 4 concludes.

## 2. The model

The board of directors acting on behalf of shareholders employs an agent (the CEO) to run a firm. The final firm value  $\tilde{X}$  is determined by a stochastic technology  $\tilde{X} = e + \tilde{\theta} + \tilde{\omega}$ , where  $e$  is the unobservable productive effort expended by the CEO,  $\tilde{\theta}$  is the CEO’s uncertain ability and  $\tilde{\omega}$  is the firm specific risk.

<sup>2</sup> In their excellent survey of the economic literature on board of directors, [Hermalin and Weisbach \(2003\)](#) argue that formal economic theory on boards has been quite limited.

We employ the standard normality assumptions on the distributions of  $\tilde{\omega}$  and  $\tilde{\theta}$  and assume that  $\tilde{\omega} \sim N(0, \Sigma)$  and  $\tilde{\theta} \sim N(0, \eta)$ . Furthermore,  $\tilde{\omega}$  and  $\tilde{\theta}$  are independent and the CEO also does not have any superior information about her ability.

The CEO has control on total available company resources given by  $T$ . He/She can allocate  $T$  between productive effort  $e$  that contributes to shareholder value or divert resources to certain other projects which yields a monetary benefit  $b(\cdot)$  for himself/herself and to some extent for the board (but not the shareholders). We assume that  $b(\cdot)$  is decreasing in  $e$ . For a closed form solution, we further impose that  $b(\cdot)$  is specified as  $b(\cdot) \equiv T - (e^2)/2$ .

### 2.1. Lack of independence

We model the board's lack of independence as the degree that the board also derives utility from  $b(\cdot)$ . We consider the possibility that, at least to a certain degree, the board as well enjoys the benefits that the CEO creates by diverting company's resources. In particular, the board's benefit is given by  $\beta b(\cdot)$  where  $\beta \in [0, 1]$ .  $\beta = 0$  corresponds to a board which is completely aligned with the shareholders and fully independent.

In this setting, we focus on two roles played by the board: The board monitors the CEO and determines the compensation contract of the CEO.

### 2.2. Monitoring

Prior to offering an incentive contract, the board engages in monitoring the CEO and observes an information signal  $\tilde{s}$  correlated with CEO's unknown ability as  $\tilde{\theta} = \tilde{s} + \tilde{\varepsilon}$ . The noise term  $\tilde{\varepsilon}$  is distributed with  $N(0, h^{-1})$  and  $E[\tilde{s}\tilde{\varepsilon}] = 0$ . The signal precision  $h$  is chosen by the board and it is a measure of the board's monitoring intensity. A signal with precision  $h$  costs the board  $c(h)$  with  $c(\cdot)$  increasing and convex in  $h$ . The signal on CEO's ability is also observable by the CEO. The posterior distribution of CEO's ability conditional on signal  $s$  is then given by  $(\hat{\theta}|s) \sim N(s, h^{-1})$ .

### 2.3. Compensation contract

We restrict attention to linear compensation contracts. The CEO's compensation contract is described by a pair  $(F, \alpha)$  where  $F$  is a fixed payment and  $\alpha$  is the manager's share of the final firm value. In what follows, we refer to  $\alpha$  as the pay-performance sensitivity of the CEO's compensation scheme. Finally, we assume that the CEO has exponential preferences with a constant absolute risk aversion coefficient  $a > 0$ .

For the reader's convenience, we summarize the sequence of events in the model below.

*Date 0:* The board chooses the intensity to monitor the CEO. Monitoring intensity determines the precision of the signal on CEO ability.

*Date 1:* The board observes a signal  $s$  on CEO ability and sets a compensation scheme.

*Date 2:* The CEO allocates resources between value maximizing activities and perks that only benefit the CEO and the board.

*Date 3:* Firm value is realized and consumption takes place.

### 3. Analysis

In this section, we solve the model backwards and derive its equilibrium.

*CEO's effort choice:* Given the signal  $s$  on her ability and the compensation contract  $(\alpha, F)$ , the CEO chooses  $e$  to maximize

$$E[\tilde{W}|s] - (a/2)\text{Var}[\tilde{W}|s]$$

where the CEO's final wealth  $\tilde{W}$  is given by

$$\tilde{W} = F + \alpha\tilde{X} + b(.). \quad (1)$$

We have

$$E[\tilde{W}|s] = \alpha(e + s) + T - (e^2)/2 + F \quad (2)$$

$$\text{Var}[\tilde{W}|s] = \alpha^2\left(h^{-1} + \sum\right). \quad (3)$$

Accordingly, the optimal effort choice  $e^*$  is given by  $e^* = \alpha$ .

*Compensation contract:* Given the lack of independence  $\beta$  from the CEO and the signal  $s$  on the CEO's ability, the board chooses  $(F, \alpha)$  to maximize

$$(1 - \alpha)E[\tilde{X}|s] + \beta b(.) - F \quad (4)$$

subject to  $e^* = \alpha$  and the CEO's participation constraint

$$E[\tilde{W}(\alpha, F, e^*)|s] - (a/2)\text{Var}[\tilde{W}(\alpha, F, e^*)|s] \geq 0, \quad (5)$$

where we normalize the CEO's reservation utility to zero. In equilibrium, this constraint holds as an equality and hence

$$F = (a/2)\alpha^2\left(h^{-1} + \sum\right) - \alpha(\alpha + s) - b(e^*). \quad (6)$$

Substituting for  $F$  and  $b(.)$ , the board's problem becomes choosing  $\alpha$  to maximize

$$(\alpha + s) + (\beta + 1)\left[T - (\alpha^2/2)\right] - (a/2)\alpha^2\left(h^{-1} + \sum\right). \quad (7)$$

Therefore, we have,

**Proposition 1.** (i) *The optimal pay-performance sensitivity  $\alpha^*$  is given by*

$$\alpha^* = \frac{1}{1 + \beta + a\left(h^{-1} + \sum\right)}.$$

(ii) *The optimal pay-performance sensitivity  $\alpha^*$  is increasing in the board's monitoring intensity  $h$  and it is decreasing in the board's lack of independence  $\beta$  from the CEO.*

The above result establishes the relation between board independence and pay-performance sensitivity of CEO compensation. A board which benefits less from CEO's perks (with a low  $\beta$ ) has more incentives to maximize shareholder value. Such a board corresponds to a well-governed firm with

the primary objective of giving the CEO correct incentives. This result reconciles the two different views of CEO compensation as discussed in [Bertrand and Mullainathan \(2000\)](#). They argue that the optimal contracting view with a metaphorical principal completely independent from the CEO and the skimming view where the CEO completely controls her own pay process need not be contrasted. These two views, they argue, may both be true and they may correspond to different degrees of effective governance. In our setting, the lack of independence parameter  $\beta$  serves this purpose and measures the extent that the board is interested in maximizing shareholder value. We next analyze how board independence determines its monitoring intensity.

*Board's choice of monitoring intensity:* Given the subsequent compensation contract  $(\alpha^*, F)$  and the CEO's equilibrium  $e^*$ , the board's ex ante expected payoff can be written as

$$\alpha^* + (1 + \beta)[T - (\alpha^*)^2/2] + (a/2)(\alpha^*)^2(h^{-1} + \Sigma) - c(h). \quad (9)$$

Excluding the terms that do not depend on  $h$  and substituting for  $\alpha^*$ , the board's problem of monitoring intensity choice can be written as

$$h^* \in \arg \max (1/2) \left[ 1 + \beta + a(h^{-1} + \Sigma) \right]^{-1} - c(h) \quad (10)$$

which yields,

**Proposition 2.** (i) *The equilibrium monitoring intensity  $h^*$  of the board is unique and it is determined by*

$$\frac{a}{2 \left[ a + h(1 + \beta + a \Sigma) \right]^2} = c'(h). \quad (11)$$

(ii) *A more independent board monitors more. Board's monitoring intensity is decreasing in the firm specific risk  $\Sigma$ .*

In our model, board's monitoring serves to decrease the ex ante uncertainty arising from the unknown managerial ability. A more independent board is more interested in giving high powered incentives to the CEO to maximize firm value. Due to CEO's risk aversion, the higher the ex ante uncertainty in firm value over which the CEO has no control, the lower is the pay-performance sensitivity. The value of gathering information about manager's unknown ability is higher for an independent board. Better information on CEO ability decreases the ex ante uncertainty and allows the board to increase pay-performance sensitivity. Therefore as  $\beta$  decreases, the board monitors and learns more about CEO ability.

#### 4. Conclusion

We analyze a model of CEO compensation where a board of directors which is not completely independent from the CEO set CEO pay. We show that the board's monitoring intensity and the equilibrium pay-performance sensitivity of CEO's pay are increasing in the board's independence from the CEO. The setting we propose reconciles the two seemingly contrasting views of executive compensation by introducing board's lack of independence as a measure of effective corporate governance.

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