

Discussion Paper No. 001

Managerial Bargaining Power  
and  
Board Independence

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October, 2003

21COE  
Interfaces for Advanced Economic Analysis  
Kyoto University

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November 26, 2002

Revised: June 12, 2003

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\*I would like to thank Koichi Futagami, Shingo Ishiguro, Kenichi Shimomura, Katsuya Takii, and seminar participants at Osaka University and Chukyo University for their helpful comments.

## Managerial Bargaining Power and Board Independence

### Abstract

This paper considers how a Chief Executive Officer (CEO) designs a bargaining process for the determination of his or her own compensation by selecting the level of independence of board members in order to influence the compensation determination process within the board and the monitoring ability of the board. The formulation is consistent with the rent extraction view, which regards the compensation contract as an instrument for the CEO to extract rents, and also with the view that the CEO forces the owners of the firm to pay high compensation by influencing some parameters in the agency problem. The CEO may design his or her bargaining power so as to set a high level of compensation and a low possibility of being fired. However, he or she cannot neglect the role of independent outside directors because their monitoring function can increase the CEO's expected compensation by raising the expected outcome of the firm. The independence level of board members, which is determined by the CEO prior to the compensation bargaining, indicates the board's pre-commitment level of monitoring. Hence, the CEO needs to allow the board to be an effective monitor to some extent, even though he or she can freely choose the composition of the board. Nevertheless, the fraction of independent outside directors on the board must be less than or equal to  $\frac{1}{2}$ , which is lower than that obtained by the CEO and shareholders' joint surplus maximization problem. The model predicts several testable implications for the optimal composition of board members.

**JEL Classification Numbers:** D23, D73, D82, G34, J33

**Keywords:** board of directors, executive compensation, managerial bargaining power, corporate governance.

## 1. Introduction

The purpose of this paper is to discuss how the CEO designs a bargaining process for the determination of his or her own compensation at the expense of shareholders by playing an active role in the relationship with the board of directors. To this end, we model a situation in which the CEO can determine his or her bargaining power endogenously by selecting the independence level of board members in order to influence the bargaining process of his or her compensation and the monitoring ability of the board.

To examine the influence of the CEO on the board, we consider two functions of the corporate board: (i) the board offers compensation packages to the CEO; and (ii) the board monitors the CEO by observing measures of performance, and decides whether to dismiss the CEO.

The board of directors is responsible for determining the compensation of the CEO. As the board is an agent delegated to maximize shareholder wealth, it is generally believed that it seeks to offer the CEO a compensation plan designed to align the interests of the CEO with those of shareholders. However, the CEO is likely to have a substantial influence on his or her own compensation through inside or affiliated directors, because the interests of these directors are too greatly tied to those of the CEO.<sup>1</sup> In fact, there are independent outside directors who have no affiliation with the firm other than their board seat. They are better aligned with shareholders because their reputation depends on the value of the firm and their incentives are not distorted by private benefits from firm projects. Recently, most of the large public corporations in the U.S.A. have delegated the determination of CEO compensation to compensation committees with a majority of members made up of ‘nominal’ out-

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<sup>1</sup>Inside directors are management; “gray” or “affiliated” directors are directors who have some ties to the firm; and independent outside directors are non-management directors who are not otherwise affiliated with the firm. Several researchers use “gray” or “affiliated” directors in the sense that these directors are presumed intermediate in independence between outside and inside directors.

side directors. Nevertheless, several researchers are skeptical of the independence of these ‘nominal’ outside directors.<sup>2</sup> Thus, in reality, it is more plausible to suppose that inside or affiliated directors, who are aligned with the CEO, bargain with truly independent directors, who are aligned with shareholders, in the CEO compensation determination. The CEO’s bargaining power then depends on the board members’ level of independence.

The board also monitors the performance of the CEO and decides whether to retain or to replace him or her. The careers of the inside directors are closely tied to the CEO’s, while affiliated directors tend to fear jeopardizing their product or financial market relations. Consequently, these kinds of directors prefer not to fire the CEO. On the other hand, independent outside directors have a greater preference for monitoring than inside or affiliated directors because independent outsiders are better aligned with shareholders.<sup>3</sup> Thus, the monitoring function of the board is strengthened as the proportion of independent outside directors on the board increases.

We need to examine how board members are appointed by the CEO because not only the CEO’s bargaining power in the compensation determination process, but also the board’s monitoring function, depend on the level of independence of board members chosen by the CEO. As argued in a number of the empirical studies listed in Bebchuk, Fried, and Walker (2001), the CEO dominates the board nomination process. Most of the large public corporations in the U.S.A. do not have fully independent nominating committees (Bertsch et al. (1998)). When there is no nominating

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<sup>2</sup>Yermack (1997) reports earlier data indicating that a large number of compensation committee members benefited from personal consulting contracts or from the diversion of company business to their principal employers. Hermalin and Weisbach (1998) suggest that because of interlocking boards, it is hard to imagine that outside directors with some degree of *dependence* could not be found. For more comprehensive arguments about this issue, see Bebchuk, Fried, and Walker (2001).

<sup>3</sup>Some researchers show that firms with outsider-dominated boards are significantly more likely to remove the CEO on the basis of poor stock performance than are firms with insider-dominated boards. See Weisbach (1988) and Boeker (1992).

committee, or when the CEO is involved in the nominating committee, firms appoint fewer independent outside directors (Shivdasani and Yermack (1999)). Furthermore, even if the CEO does not sit on the nominating committee, his or her influence on the nomination process would be considerable (Main et al. (1995)).

Even though the CEO's influence is considerable, if he or she selects the level of independence of board members before the board determines the compensation structure and monitors performance, then he or she faces a trade-off concerning the choice of the composition of the board. First, by choosing the board composition *ex ante*, the CEO can induce the board to be pre-committed to its monitoring level of his or her performance. Since a higher level of independence of board members implies a higher level of effectiveness of board monitoring, this increases the expected revenues of the firm, thereby yielding an increase in the expected compensation of the CEO. Second, the CEO can provide him or herself with rent by choosing the board composition in order to influence both the compensation level and the possibility of being fired. Since a higher independence of board members means less bargaining power and a higher possibility that the CEO could be fired, this decreases the CEO's expected compensation and fringe benefits. As a result, the CEO must weigh the benefits of increasing the independence of board members against the potential costs.

In this paper, given the trade-off faced by the CEO in the board nomination process, we discuss how the CEO determines the independence level of board members and influences the board's process of offering the CEO a compensation contract and monitoring his or her performance. Although the CEO may design his or her bargaining power to set a high level of compensation and a low possibility of being fired, the trade-off mentioned above suggests that the role of independent outside directors cannot be neglected because their monitoring function increases the CEO's expected compensation by raising the firm's expected outcome. The independence level of board members determined by the CEO prior to the compensation bargaining indicates the pre-commitment level of the effectiveness of board monitoring over the

CEO's performance. Hence, the CEO needs to allow the board to be an effective monitor, to some extent, even though he or she can freely choose the composition of the board.

To achieve the aims of this paper, we consider a model in which the CEO has some discretion over the choice of the board's composition, in terms of the proportion of (truly) independent outside directors on the board. After the CEO selects the board members, bargaining over the CEO's compensation occurs within the board. Given the substantial influence of the CEO over "nominally" independent directors, the interests of "nominally" independent directors are aligned with those of the CEO in the bargaining process. We model this process as a generalized Nash bargaining game between "nominally" independent directors and truly independent outside directors, where the surplus of each group is weighted by the fraction of each group on the board. As a result of the compensation bargaining, the board offers a compensation contract to the CEO. In the course of project implementation by the CEO, the board monitors his or her performance. The willingness of directors to observe and verify any poor performance of the CEO increases with the level of their true independence. After the board evaluates the CEO's performance, it decides whether to dismiss the CEO and hire a replacement.

The first main result obtained in this paper is summarized as follows:

(i) If the CEO chooses the composition of the board, the fraction of truly independent outside directors on the board is less than or equal to  $\frac{1}{2}$ . The independence level of the board members is lower in this case than when the CEO and shareholders jointly maximize their surplus.

Our first main result contrasts with the result of Hermalin and Weisbach (1998, Proposition 5), who argued that the level of board independence attained under the bargaining process between the CEO and the board is not lower than that attained under the joint surplus maximization. The striking difference between our result and that of Hermalin and Weisbach is mainly due to the differences in the formulation of

the two models. In order to discuss how the CEO selects the composition of board members and, as a result, determines his or her bargaining power endogenously, our model takes into account the influences of these decisions over the CEO compensation bargaining process within the board and the monitoring process through the board. Even though a few models, such as Hermalin and Weisbach, formally endogenize the composition of the board, they do not explicitly discuss how the board composition determines the bargaining power of the CEO in the process of bargaining his or her compensation. We provide a considerably simpler model for this determination and show that the CEO chooses a lower fraction of independent outside directors on the board than the CEO and shareholders' joint surplus maximization does.

We also obtain the following comparative static results.

(ii) The fraction of truly independent outside directors on the board decreases with an increase in the project earnings under the high (or low) ability CEO, in the prior probability that the incumbent CEO has high ability, and in control benefits to the CEO; whereas it increases with the expected project earnings under a new CEO and the board's effectiveness in observing and verifying the CEO's poor performance (or low ability).

The comparative static results described above have the following empirical implications, which form our third main result:

(iii) The fraction of truly independent outside directors on the board is more likely to be small for firms with good business conditions, firms in high technology industries or with high growth opportunities, firms with large free cash flows or with the incumbent CEO as a founder, firms in which the effectiveness of external governance mechanisms is not restricted, firms with inside directors whose career concerns are closely tied to internal promotion to the CEO position, and firms in industries where the characteristics of firms are less homogeneous.

There are several theoretical models of the corporate board's role. Maug (1994) develops a model that examines the comparative advantage of the board over other ex-

ternal control mechanisms in disciplining management. Hirshleifer and Thakor (1994, 1998) consider how a takeover environment affects the corporate board's decisions to dismiss the CEO and hire a replacement. Beetsma, Peters, and Rebers (2000) study the role of collusion between management and the board of directors. Raheja (2000) discusses competition between insiders for CEO succession, which motivates them to provide inside information to the board, and endogenously determines the size and the composition of the board that maximizes the firm value. Adams (2001) analyzes the consequences of the board's dual role as an advisor as well as a monitor of management, and derives the optimal composition of the board that maximizes the firm value. Almazan and Suarez (2003) characterize the optimal CEO compensation and replacement policies corresponding to a weak board and a strong board, respectively, and explain when and why the composition of some degree of entrenchment and a sizeable severance package is desirable from the viewpoint of the maximization of the ex ante shareholders' value.

Other researchers are concerned with the influence of the CEO over the board through the board nomination process. Hermalin and Weisbach (1998) characterize the composition of the board and the compensation of the CEO as the outcome of a bargaining process between the CEO and the rest of the board. They develop a model for understanding the dynamic interactions between management and the board. Warther (1998) investigates how the board's effectiveness in disciplining management is affected by the ability of the CEO to fire dissenters.

Dow and Raposo (2001) study a model in which the CEO (the active agent) influences the parameters of constraints in the agency problem by proposing opaque corporate strategies, and forces the owners of the firm (the passive principals) to pay him or her high compensation. Bebchuk, Fried, and Walker (2001) examine the rent extraction view that executives have the power to influence their own compensation, and use this power to extract rents.

Although the standard agency model (the optimal contracting view) regards exec-

utive compensation as an instrument for shareholders to mitigate the agency problem between executives and shareholders, the rent extraction view regards such compensation as an instrument for executives to extract rents.<sup>4</sup> The spirit of our model is similar to that of the model of active agents and passive principals of Dow and Raposo (2001) and that of the rent extraction view of Bebchuk, Fried, and Walker (2001), rather than that of the other models, which are concerned with the endogenous determination of board composition.

The paper is organized as follows. In section 2, we present our basic model and, as a benchmark, we derive the solution to the problem that maximizes the sum of the expected surpluses of the CEO and shareholders. In section 3, we analyze the basic model, and obtain the optimal fraction of independent outside directors on the board. We also provide comparative static results on the board composition and discuss their empirical implications. The final section concludes the paper.

## 2. The Model

### 2.1. The basic environment.—

We describe a model of the board of directors that is chosen by an incumbent CEO.

The CEO receives a positive control benefit of  $b$  if he or she retains his or her position until the completion of a project. The control benefit causes the interests of the CEO to be misaligned with those of shareholders. We assume that the CEO does not have any ownership (or option) stakes from the start. Nevertheless, in subsection 4.1, we will show that our obtained results still hold even though the CEO has an ownership (or option) stake from the beginning.

The board determines the CEO's compensation, and monitors him or her to evaluate his or her ability. The board members chosen by the CEO are made up of

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<sup>4</sup>The rent extraction view can also be applied to the compensation contract between the investment bank and its affiliated analysts. See Osano (2002).

inside and outside directors.<sup>5</sup> We assume that the interests of inside directors are completely aligned with those of the CEO unless the board observes or verifies that his or her ability is low.<sup>6</sup> This is because their careers are too greatly tied to the CEO's. However, if the board observes and verifies that the CEO's ability is low, then inside directors support the interests of shareholders because they are afraid their failure to discharge the low ability CEO will lead to a lawsuit, a loss of their reputations, or a takeover by another firm. On the other hand, we assume that the interests of outside directors are completely aligned with those of shareholders since outside board members have no affiliation with the firm other than their board seat. Thus, the fraction of outside directors on the board can be interpreted as the level of independence of board members. We assume that shareholders play no explicitly active role, and that they do not know the CEO's ability unless the board observes or verifies his or her ability. All players in this model are risk neutral.

We set up a four-period model. The timing of events is described in Figure 1.

In period 0, the firm has a CEO and faces a new project. The CEO chooses the composition of the board of directors that will determine his or her compensation and monitor performance to evaluate his or her ability.<sup>7</sup> Since the board consists of inside and outside directors, the board composition is captured by the fraction of outside directors on the board,  $\kappa \in [0, 1]$ . The CEO is either of high or low ability,

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<sup>5</sup>For simplicity of notation, in the subsequent analysis, we define inside directors as a category that includes gray or affiliated directors. 'Nominal' outside directors whose independence remains uncertain are also included in the category of inside directors.

<sup>6</sup>This is a common assumption in the literature on the board of directors. Hermalin and Weisbach (1998), Raheja (2000), and Adams (2001) employ similar assumptions. Almazan and Suarez (2003) consider two polar types of board: weak and strong. The weak board enables the incumbent CEO to preserve his control rents by simply opposing his replacement, whereas the strong board gives shareholders full power to replace the CEO even though they do not always want to do so. In their model, the board is only concerned with the replacement decision.

<sup>7</sup>For the justification of this assumption, see the discussion and literature surveyed in Bebchuk, Fried, and Walker (2001).

designated as  $H$  or  $L$ , respectively, under the new project. None of the players know the CEO's ability under the new project at this stage.<sup>8</sup> Instead, all of the players are under the prior belief that there is a probability  $\sigma_H \in (0, 1)$  that the incumbent CEO has high ability. If the CEO has high (or low) ability, the realization of the earnings of the project in period 3 is  $y_H$  (or  $y_L$ ). Note that  $y_H > y_L > 0$ .

In period 1, the board determines the CEO's compensation. In the bargaining process, inside directors support the interests of the CEO, whereas outside directors protect the interests of shareholders. If the bargaining fails, the CEO is dismissed, and a new CEO is randomly selected from the pool of available managers. The board then bargains with the new CEO about his or her compensation. However, since the new CEO is less familiar with the firm's business than the previous CEO, the expected earnings of the project in period 3 under the new CEO,  $r_N$ , are smaller than those under the previous CEO,  $y_H\sigma_H + y_L(1 - \sigma_H)$ . Furthermore, the new CEO has no bargaining power because all replacement CEOs are ex ante identical and inside directors do not necessarily support the interests of the new CEO. Hence, the board can minimize the expected compensation payment to the new CEO, and set it equal to zero.

In period 2, the board investigates the progress of the project and uses this information to evaluate the CEO's performance (or ability). We assume that the board can verify that the CEO is of low ability only if outside directors observe and verify the CEO's low ability. We also assume that the probability of outside directors observing and verifying the CEO's low ability is proportional to the fraction of outside

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<sup>8</sup>If the CEO constantly faces new challenges, all of the players could be less certain about whether the CEO achieves a good outcome in the new project or about how they will interpret the previous outcome of the CEO in order to evaluate his or her future performance. In particular, this assumption can be justified if uncertainty about the CEO's ability in a particular project is partly due to uncertainty about a match between the CEO and the firm's project. For the relaxation of this assumption, see the discussion in subsection 4.4.

directors on the board,  $\kappa$ , that is,  $\beta\kappa$ .<sup>9,10</sup> Since inside directors are afraid of a lawsuit against themselves or a loss of their reputation, or a takeover of their firm, if they fail to discharge the low ability CEO, we assume that inside directors support the interests of shareholders if the board verifies that the CEO's ability is low. Thus, all the board members agree to dismiss the CEO and hire a replacement if the board verifies the CEO's low ability. The expected earnings of the project in period 3 under the replacement CEO are still  $r_N$ . As discussed in the case of the new CEO in period 1, the replacement CEO has no bargaining power. Thus, his or her expected compensation payment is set equal to zero.

In period 3, the project earnings are realized. The compensation of the original CEO is paid according to the contract arrangements predetermined in period 1. The original CEO receives control benefits  $b$  if he or she remains in control until this period. For simplicity, we assume that the new CEO does not enjoy any control benefits even though the board replaces the original CEO with the new CEO in period 2.<sup>11</sup>

Since the project earnings realized in period 3 are observable and verifiable, the CEO's compensation is made contingent on the project earnings realized in period 3. Furthermore, the CEO's compensation can also depend on whether the CEO retains his or her position. Thus, the compensation contract offered to the incumbent CEO in period 1 is represented by  $\{w_H, w_L, z\}$ , where  $w_H$  is wage compensation if the

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<sup>9</sup>This assumption implies that the expected revenues of the firm increase with the independence of the board of directors. In subsection 4.3, we will discuss how our main result is robust if this assumption is relaxed. Another possible formulation might be to assume that the probability of outside directors observing and verifying the CEO's low ability is proportional to the number of outside directors on the board. However, some empirical studies (for example, see Yermack (1996)) suggest that the effectiveness of board monitoring decreases with an increase in the size of the board. Thus, in this paper, we adopt the formulation in the text.

<sup>10</sup>Since we simply assume that the effectiveness of outside directors is proportional to their fraction on the board, the monitoring technology is represented by a reduced form. However, similar assumptions are also used in Hermalin and Weisbach (1998) and Adams (2001).

<sup>11</sup>The relaxation of this assumption cannot modify any of our main results.

incumbent CEO retains his or her position and the period 3 project earnings are  $y_H$ ;  $w_L$  is wage compensation if the incumbent CEO retains his or her position and the period 3 project earnings are  $y_L$ ; and  $z$  is the severance payment if the incumbent CEO is fired. Because the CEO is protected by limited liability, these compensation payments must be nonnegative,  $(w_H, w_L, z) \geq 0$ .

However, the CEO does not know his or her ability until period 2. Thus, the CEO cannot signal his or her ability and nor can the board implement compensation contracts to induce the CEO to reveal his or her ability type. In addition, we assume that it is too costly to renegotiate the compensation contract arrangements determined in period 1.

We now specify the expected payoff of each player. The expected payoff of the CEO,  $\Pi_C$ , is given by

$$\Pi_C = (w_H + b)\sigma_H + (w_L + b)(1 - \beta\kappa)(1 - \sigma_H) + z\beta\kappa(1 - \sigma_H). \quad (1)$$

Here, the first term of (1) represents the CEO's payoff if his or her ability is high. Then, he or she obtains the compensation  $w_H$  and receives control benefits  $b$ . The second term of (1) expresses the CEO's payoff if his or her ability is low but this low ability is not verified by the board. Then, he or she obtains the compensation  $w_L$  and receives control benefits  $b$ . The final term of (1) indicates the CEO's payoff if his or her ability is low and this low ability is verified by the board. In this case, the CEO is fired. Thus, he or she obtains only the severance payment  $z$  and cannot receive control benefits  $b$ .

The expected payoff of shareholders,  $\Pi_S$ , is represented by

$$\Pi_S = (y_H - w_H)\sigma_H + (y_L - w_L)(1 - \beta\kappa)(1 - \sigma_H) + (r_N - z)\beta\kappa(1 - \sigma_H), \quad (2)$$

where the first term of (2) implies the payoff of shareholders if the CEO's ability is high. The second term of (2) shows the payoff of shareholders if the CEO's ability is low but this low ability is not verified by the board. The final term of (2) indicates

the payoff of shareholders if the CEO's ability is low and this low ability is verified by the board. Since a new CEO is hired, the realized expected earnings are  $r_N$ .

The board's utility function is complicated because the board consists of inside and outside directors. We have already assumed that the interests of inside directors before the verification of the CEO's low ability are completely aligned with those of the CEO given by (1), whereas the interests of outside directors are completely aligned with those of shareholders and are expressed by (2). In the subsequent analysis, we assume that the board's decision process is captured by a generalized Nash bargaining process between inside and outside directors, where the surplus of each group is weighted by the fraction of each group on the board.<sup>12</sup>

For the rest of the analysis, we impose the following assumptions:

**Assumption 1:**  $y_L + b < r_N$ .

**Assumption 2:**  $r_N + b \leq y_H\sigma_H + y_L(1 - \sigma_H)$ .

Assumption 1 implies that the sum of the project earnings under the low ability CEO,  $y_L$ , and his or her control benefits,  $b$ , is smaller than the expected project earnings under the new CEO,  $r_N$ . This ensures that it is efficient to replace the incumbent CEO with the new one if the board verifies that his or her ability is low. Assumption 2 indicates that the sum of the expected project earnings under the new CEO,  $r_N$ , and the control benefits of the incumbent CEO,  $b$ , is smaller than or equal to the expected project earnings under the incumbent CEO,  $y_H\sigma_H + y_L(1 - \sigma_H)$ .<sup>13</sup> As discussed in the subsequent analysis, this assumption is required to guarantee that

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<sup>12</sup>Although this is a reduced form for the decision of the board on the CEO's compensation, Hermalin and Weisbach (1998) also assume a similar reduced form for the bargaining between the CEO and the board.

<sup>13</sup>Similar assumptions are made in Hermalin and Weisbach (1998) and Adams (2000) although Assumption 2 requires that the control benefits of the CEO are not large enough.

the compensation of the high ability CEO is positive under the optimal contract.

## 2.2. Joint surplus maximization solution.—

As a benchmark, we consider the case in which the sum of the expected payoffs of the CEO and the shareholders,  $\Pi_C + \Pi_S$ , is jointly maximized. The joint surplus maximization problem is expressed by

$$\max_{0 \leq \kappa \leq 1} (y_H + b)\sigma_H + (y_L + b)(1 - \beta\kappa)(1 - \sigma_H) + r_N\beta\kappa(1 - \sigma_H).$$

Solving this problem with respect to  $\kappa$  yields

$$(r_N - y_L - b)\beta(1 - \sigma_H) - \mu_1 + \mu_2 = 0,$$

where  $\mu_1$  and  $\mu_2$  are the nonnegative multipliers associated with  $1 \geq \kappa$  and  $\kappa \geq 0$ , respectively.

Now, we show the following proposition.

**Proposition 1** *Suppose that Assumption 1 holds. Under the joint surplus maximization, the optimal fraction of outside directors on the board is equal to 1. In other words, the board should comprise only outside directors.*

Even though a part of the surplus shared between the CEO and shareholders depends on the chance that the CEO obtains control benefits, the optimal fraction of outside directors on the board must be equal to 1. This is because of the assumptions that (i) the marginal disutility of monitoring intensity is equal to zero, and (ii) the joint surplus is larger if the bad CEO is discharged than if the bad CEO is retained (Assumption 1). These assumptions lead us to set the joint surplus-maximizing solution to maximize the probability of the bad CEO being fired.<sup>14</sup>

However, such a formulation ignores the fundamental problem that it is the CEO who selects the composition of the board. If the CEO chooses the composition of

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<sup>14</sup>If the marginal disutility of monitoring intensity is positive, then the optimal  $\kappa$  is less than 1. Such relaxation, however, does not modify any of our main results.

the board, this would result in opportunistic behavior because the CEO, not only desires to obtain the stronger bargaining power in the compensation determination process, but also prefers to avoid being replaced in period 2 and wants to reduce the possibility that his or her low ability will be verified. Thus, the CEO's private incentives to increase his or her own compensation and to improve the chance of obtaining control benefits would induce him or her to choose a fraction of outside directors on the board that is lower than the joint surplus-maximizing one.

In the subsequent analysis, we will therefore return to the basic model of the preceding subsection, in which the CEO determines the composition of the board before starting the new project. We will also examine how the compensation contract offered by the board to the CEO can mitigate the opportunistic behavior of the CEO.

### 3. Analysis

The game described in subsection 2.1 is solved by backward induction. First, we analyze the bargaining problem concerning the CEO's compensation within the board in period 1. Next, we discuss the decision problem of the CEO with respect to the choice of board composition in period 0.

#### 3.1. The compensation determination process within the board.—

We model the negotiation process within the board as a generalized Nash bargaining game. In this bargaining game, inside and outside directors determine a compensation contract for the CEO,  $(w_H, w_L, z)$ , so as to maximize the generalized Nash product of their surpluses, where the surplus of each group is weighted by the fraction of each group on the board.

The surplus of each agent is represented by the difference between what he or she expects to receive if an agreement is reached and what he or she expects to receive if no agreement is reached. As assumed in the preceding section, if the bargaining fails, the CEO is fired and a new CEO is randomly selected from the pool of available managers.

Under the new CEO, the expected earnings of the project in period 3 are  $r_N$ . However, since the new CEO has no bargaining power, his or her expected compensation can be set equal to zero. The inside directors' surplus (= CEO's surplus),  $S_I$ , and the outside directors' surplus,  $S_O$ , (= shareholders' surplus) are thus

$$S_I = \Pi_C = w_H\sigma_H + w_L(1 - \beta\kappa)(1 - \sigma_H) + z\beta\kappa(1 - \sigma_H) + b[(1 - \beta\kappa) + \beta\kappa\sigma_H],$$

$$S_O = \Pi_S - r_N = (y_H - w_H)\sigma_H + (y_L - w_L)(1 - \beta\kappa)(1 - \sigma_H) + (r_N - z)\beta\kappa(1 - \sigma_H) - r_N.$$

Under the generalized Nash bargaining, the board chooses  $(w_H, w_L, z)$  to maximize

$$\begin{aligned} & \{(y_H - w_H)\sigma_H + (y_L - w_L)(1 - \beta\kappa)(1 - \sigma_H) + (r_N - z)\beta\kappa(1 - \sigma_H) - r_N\}^\kappa \\ & \times \{w_H\sigma_H + w_L(1 - \beta\kappa)(1 - \sigma_H) + z\beta\kappa(1 - \sigma_H) + b[(1 - \beta\kappa) + \beta\kappa\sigma_H]\}^{1-\kappa}, \quad (3) \end{aligned}$$

subject to  $(w_H, w_L, z) \geq 0$  and  $(y_H - w_H)\sigma_H + (y_L - w_L)(1 - \beta\kappa)(1 - \sigma_H) + (r_N - z)\beta\kappa(1 - \sigma_H) - r_N \geq 0$ . Note that the CEO's payoff must be nonnegative because he or she is protected by limited liability, and that the outside directors' surplus must be nonnegative because otherwise the bargaining fails. Due to the limited liability constraints of the CEO, we need not impose the constraint that the inside directors' surplus must be nonnegative.

To derive the optimal compensation contract, we begin with discussing the case of  $\kappa > 0$ . Then, without loss of generality, we can assume that the outside directors' surplus is always greater than zero. Thus, taking the natural logarithm of (3) and maximizing it with respect to  $(w_H, w_L, z)$  yields the following first-order conditions:

$$-\frac{\kappa\sigma_H}{\Pi_S - r_N} + \frac{(1 - \kappa)\sigma_H}{\Pi_C} \leq 0, \quad (4)$$

$$-\frac{\kappa(1 - \beta\kappa)(1 - \sigma_H)}{\Pi_S - r_N} + \frac{(1 - \kappa)(1 - \beta\kappa)(1 - \sigma_H)}{\Pi_C} \leq 0, \quad (5)$$

$$-\frac{\kappa\beta\kappa(1 - \sigma_H)}{\Pi_S - r_N} + \frac{(1 - \kappa)\beta\kappa(1 - \sigma_H)}{\Pi_C} \leq 0. \quad (6)$$

Since (4)-(6) are reduced to the same condition

$$-\frac{\kappa}{\Pi_S - r_N} + \frac{1 - \kappa}{\Pi_C} \leq 0, \quad (7)$$

we can focus on the determination of  $w_H$  without loss of generality. Because the proof of Proposition 2 can show  $w_H > 0$  for the optimal value of  $\kappa$  that is determined in the next subsection, we can confine ourselves to the case in which  $w_H > 0$  and  $(w_L, z) \geq 0$ . We also assume that (4)-(6) are sufficient for the maximization of (3).

Given  $w_H > 0$ , rearranging (4) (or (7)) with equality leads to

$$w_H = \frac{(1 - \kappa)\{y_H\sigma_H + y_L(1 - \beta\kappa)(1 - \sigma_H) - r_N[1 - \beta\kappa(1 - \sigma_H)]\} - w_L(1 - \beta\kappa)(1 - \sigma_H) - z\beta\kappa(1 - \sigma_H) - \kappa b[1 - \beta\kappa(1 - \sigma_H)]}{\sigma_H}. \quad (8)$$

The remaining compensation variables  $(w_L, z)$  can be determined so as to satisfy the limited liability conditions of the CEO. In the next subsection, under Assumptions 1 and 2 with  $y_H > y_L$ , we can prove that  $w_H > 0$  for  $(w_L, z) = (0, 0)$  and the optimal value of  $\kappa$ . Thus, we can ensure that  $w_H > 0$  if  $w_L$  and  $z$  are sufficiently close to zero.

We next examine the case of  $\kappa = 0$ . In this case, since the constraint of the outside directors' surplus is strictly binding, we must have  $w_H = \frac{y_H\sigma_H + (y_L - w_L)(1 - \sigma_H) - r_N}{\sigma_H}$ . However, this relation is obtained by substituting  $\kappa = 0$  into (8). Thus, irrespective of whether  $\kappa > 0$  or  $\kappa = 0$ , the optimal value of  $w_H$  is represented by (8) relative to  $w_L, z$ , and  $\kappa$ .

It is immediate from (8) to see that the compensation received by the high ability CEO,  $w_H$ , depends on the fraction of outside directors on the board,  $\kappa$ . More specifically, an increase in  $\kappa$  directly decreases  $w_H$  because the CEO's bargaining power becomes weaker. On the other hand, an increase in  $\kappa$  also directly raises the probability of the board verifying a CEO's low ability. The higher verification probability is likely to enable the board to replace the low ability CEO, thereby increasing the expected earnings of the project. This indirect effect induces the board to be more likely to accept the proposal that the expected compensation of the CEO increases. Furthermore, the higher verification probability directly reduces the likelihood of the CEO receiving control benefits  $b$ . This indirectly weakens the CEO's bargaining power, thus decreasing the expected compensation of the CEO. The total effect of a

change in  $\kappa$  on  $w_H$  is, therefore, ambiguous at this stage.<sup>15</sup>

### 3.2. The optimal board composition.—

We now examine the decision problem of the CEO with respect to the composition of the board in period 0. To find the optimal composition of the board, we need to consider both the direct and indirect effects of a change in the composition of the board on the CEO's payoff.

Substituting (8) into the CEO's objective function, we characterize the CEO's maximization problem as follows:

$$\max_{0 \leq \kappa \leq 1} (1-\kappa)[1-\beta\kappa(1-\sigma_H)]b + (1-\kappa)\{y_H\sigma_H + y_L(1-\beta\kappa)(1-\sigma_H) - r_N[1-\beta\kappa(1-\sigma_H)]\}. \quad (9)$$

Note that (9) does not depend on the compensation of the low ability CEO,  $w_L$ , or the severance payment,  $z$ , because neither  $w_L$  nor  $z$  is independent of  $w_H$ .

Because the objective function of (9) is a continuous function of  $\kappa$  on  $[0, 1]$ , to simplify the analysis, we focus on a solution that satisfies  $\kappa > 0$ . Differentiating (9) with respect to  $\kappa$  then yields the first-order condition

$$-[1+\beta(1-2\kappa)(1-\sigma_H)]b - y_H\sigma_H - y_L[1+\beta(1-2\kappa)](1-\sigma_H) + r_N[1+\beta(1-2\kappa)(1-\sigma_H)] \geq 0. \quad (10)$$

Since the objective function of (9) is also a strictly concave function of  $\kappa$  under Assumption 1, the first-order condition also satisfies a sufficient condition. Rearranging

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<sup>15</sup>Indeed, the relationship between top executive compensation and board composition is examined in a number of empirical papers, but their results are mixed. Lambert, Larcker, and Weigelt (1993), Boyd (1994), and Core, Holthausen, and Larcker (1999) report a positive relation between CEO compensation and the percentage of outside directors on the board; and Finkelstein and Hambrick (1989) find that no relationship exists between these two variables. On the other hand, Lambert, Larcker, and Weigelt (1993) give evidence that CEO compensation is lower when a smaller proportion of board members is appointed by the CEO. Similarly, Core, Holthausen, and Larcker (1999) also find that CEO compensation is lower when outside directors are not appointed by the CEO or are not considered gray directors.

(10), we have

$$\kappa \leq \frac{1}{2} + \frac{r_N - y_H \sigma_H - y_L(1 - \sigma_H) - b}{2\beta(1 - \sigma_H)(r_N - y_L - b)}. \quad (11)$$

Given Assumptions 1 and 2, it is now straightforward from (11) to obtain the following proposition.

**Proposition 2** *Suppose that Assumptions 1 and 2 hold. If the CEO chooses the composition of the board, then the fraction of outside directors on the board is less than or equal to  $\frac{1}{2}$ . Thus, the CEO chooses a less independent board of directors than would be the case under the joint surplus maximization of the CEO and the shareholders.*

**Proof:** Because of Assumptions 1 and 2, it is straightforward from (11) to see  $\kappa \leq \frac{1}{2}$ . Furthermore, rearranging (8) with  $(w_L, z) = (0, 0)$  shows

$$w_H = \frac{(1 - \kappa)[y_H \sigma_H + y_L(1 - \sigma_H) - r_N - \frac{\kappa}{1 - \kappa}b] + (1 - \kappa)(r_N + \frac{\kappa}{1 - \kappa}b - y_L)\beta\kappa(1 - \sigma_H)}{\sigma_H},$$

which is positive for  $\kappa \leq \frac{1}{2}$  under Assumptions 1 and 2. Hence,  $w_H$  and  $\kappa$  determined by (8) and (11) with  $(w_L, z) = (0, 0)$  give the equilibrium solution of the model. *Q.E.D.*

Several remarks are in order. First, the intuition behind this proposition is explained by the features of our model, which are that (i) the share of the project returns received by the CEO increases with his or her bargaining power, and (ii) the CEO's payoff partly depends on his or her chance of obtaining control benefits. Thus, if the CEO chooses the composition of the board, his or her private incentives to increase his or her own compensation and to improve the chance of obtaining control benefits induce the CEO to reduce the fraction of outside directors on the board so that his or her own bargaining power is strengthened and the effectiveness of board monitoring is weakened. This opportunistic action cannot be fully prevented by the

compensation contract offered by the board to the CEO because inside directors support the interests of the CEO and use their power to extract rents for him or her in the determination process of his or her compensation.

Second, this proposition suggests that the CEO chooses a lower fraction of outside directors on the board than would occur under the joint surplus maximization problem: in other words, the CEO selects a smaller probability of the board verifying his or her low ability than the joint surplus-maximizing probability. Note that such distortion occurs even though the limited liability constraints on the CEO's compensation are not binding. In contrast, Hermalin and Weisbach (1998, Proposition 5) show that the level of board independence determined under the bargaining between the CEO and the rest of the board is the same as that determined under the joint surplus maximization if the limited liability constraint on the CEO's compensation is not binding; it only *exceeds* the joint surplus-maximizing level of board independence if the limited liability constraint is binding. The striking difference between our result and that of Hermalin and Weisbach is mainly due to the differences in the formulation of the two models. In our model, the composition of the board has direct effects not only on the verification ability of the board, but also on the bargaining power of the CEO under Assumption 2, which ensures that the limited liability constraint on the compensation of the high ability CEO is not binding. On the other hand, in their model, board composition affects only the monitoring intensity of the board under the situation in which the limited liability constraint on the CEO's compensation may be binding.<sup>16</sup>

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<sup>16</sup>Hermalin and Weisbach (1998) assume that the marginal disutility of monitoring is increasing. Although this assumption ensures that the joint surplus-maximizing level of board independence in their model is an interior solution, it does not lead us to guarantee that the level of board independence determined under the bargaining between the CEO and the rest of the board is the same as or larger than the joint surplus-maximizing level of board independence. Thus, the difference between our results and theirs does not depend on this assumption. Furthermore, such a difference still remains even though marginal disutility costs cause the joint surplus-maximizing level of board

### 3.3. Comparative statics.—

We examine how the particular characteristics of a firm determine the optimal board structure. Since the optimal  $\kappa$  is an interior solution, (11) is set to be satisfied with equality. Then, differentiating (11) with respect to each of the parameters  $y_H$ ,  $y_L$ ,  $\sigma_H$ ,  $b$ ,  $r_N$ , and  $\beta$ , we immediately obtain the following proposition.

**Proposition 3** *Suppose that Assumptions 1 and 2 hold.*

(i) *The fraction of outside directors on the board decreases with an increase in the project earnings under the high ability CEO,  $y_H$ , in the project earnings under the low ability CEO,  $y_L$ , in the prior probability that the incumbent CEO has high ability,  $\sigma_H$ , and in control benefits to the CEO,  $b$ .*

(ii) *The fraction of outside directors on the board increases with the expected project earnings under the new CEO,  $r_N$ , and the intensity of the board verifying the CEO's performance (or ability),  $\beta$ .*

The intuition behind the results of this proposition is as follows. For simplicity, we focus on the case in which  $w_L$  and  $z$  are sufficiently close to zero. An increase in the project earnings under the high ability CEO,  $y_H$ , or the project earnings under the low ability CEO,  $y_L$ , directly increases the expected project earnings under the incumbent CEO, other things being equal. Thus, these changes reduce the role of the board in verifying the incumbent CEO's low ability, and directly raise the compensation received by the high ability CEO,  $w_H$ , if the fraction of outside directors on the board,  $\kappa$ , does not change (see (8)). As a result, the incumbent CEO can reduce  $\kappa$  without worrying that a reduction in the effectiveness of board monitoring decreases  $w_H$ .

An increase in the prior probability that the incumbent CEO has high ability,  $\sigma_H$ , increases not only the expected project earnings under the incumbent CEO but also his or her expected control benefits. Both of these effects directly raise  $w_H$  under

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independence in our model to be less than 1.

Assumption 1 if  $\kappa$  does not change. Thus, the incumbent CEO can lower  $\kappa$  under Assumption 1.

An increase in control benefits to the CEO,  $b$ , directly raises the incumbent CEO's willingness to lower  $\kappa$ . Anticipating this, outside directors attempt to reduce  $w_H$  because the lower  $\kappa$  causes shareholders to suffer losses in their profits. In fact, since the former direct effect dominates the latter indirect effect, the incumbent CEO is induced to reduce  $\kappa$ .

A rise in the expected project earnings under the new CEO,  $r_N$ , directly decreases the outside directors' (shareholders') surplus. Anticipating this, outside directors attempt to reduce  $w_H$ . To avoid a substantial reduction in  $w_H$ , the incumbent CEO is motivated to raise  $\kappa$ , thereby increasing the probability of the board verifying that the CEO's ability is low.

Finally, an increase in the intensity of the board verifying the incumbent CEO's low ability,  $\beta$ , directly raises the outside directors' (shareholders') surplus while reducing the incumbent CEO's surplus. These two effects lead outside directors to allow a rise in  $w_H$  under Assumption 1 if  $\kappa$  does not change. Combining those three effects under Assumptions 1 and 2, we see that the incumbent CEO is motivated to raise  $\kappa$  because he or she expects that a rise in  $\kappa$  serves to increase his or her surplus.

We next proceed to consider how the parameters listed in Proposition 2 are related to the various characteristics of a firm. Firstly,  $y_H$ ,  $y_L$ , and  $\sigma_H$  are a component of the expected project earnings under the incumbent CEO. This implies that an increase in  $y_H$ ,  $y_L$ , and  $\sigma_H$  captures an increase in the profitability of the firm under the incumbent CEO. If so, these parameters are larger for firms with good business conditions. On the other hand,  $r_N$  expresses the expected project earnings under the new CEO. Thus, an increase in  $y_H$ ,  $y_L$ , and  $\sigma_H$  and a decrease in  $r_N$  can be interpreted as an increase in the need for specific management knowledge of the firm. Such a need is likely to be higher for firms in high technology industries or firms with high growth opportunities because managers of such firms are required to have some

specific knowledge of the firm.

Secondly, since  $b$  indicates control benefits to the CEO, it is likely to be larger in firms with large free cash flows and firms with the incumbent CEO as a founder. This parameter can also be interpreted as the inside directors' willingness to protect the interests of the incumbent CEO. This interpretation suggests that  $b$  is larger for firms with inside directors whose career concerns are closely tied to internal promotion to the position of CEO.

Finally, the inverse of  $\beta$  represents the difficulty that outside directors have in observing and verifying the incumbent CEO's low ability. Thus,  $\beta$  is likely to be lower for firms in high technology industries, firms with high growth opportunities, and firms in industries where the characteristics of all firms are less homogeneous. This parameter can also be interpreted as the relative importance of board monitoring in various governance mechanisms. Hence, this view suggests that  $\beta$  is likely to be lower for firms in which the effectiveness of external governance mechanisms is not restricted.

Combining the interpretations of the parameters with the results of Proposition 2, we derive the following empirical implications.

**Proposition 4** *The fraction of independent outside directors on the board is more likely to be small for (i) firms whose business conditions are good, (ii) firms in high technology industries or firms with high growth opportunities, (iii) firms with large free cash flows or firms with the incumbent CEO as a founder, (iv) firms with inside directors whose career concerns are closely tied to internal promotion to the CEO position, (v) firms in industries where the characteristics of all firms are less homogeneous, and (vi) firms in which the effectiveness of external governance mechanisms is not restricted.*

Some of these empirical implications are consistent with findings verified by previous empirical studies. Firstly, although several empirical papers discuss how firm

value and performance is affected by the composition of the board, the empirical results are mixed. Rosenstein and Wyatt (1990) and Byrd and Hickman (1992) give positive evidence for the importance of outside directors, whereas Yermack (1996) finds no association between the percentage of outside directors and firm performance. In these empirical models, however, the composition of the board is exogenous, whereas firm value and performance is endogenous. In contrast, both of these variables are endogenous in our model. Thus, it is not surprising that the previous empirical evidence is mixed. In this sense, our empirical implication in point (i) is not necessarily inconsistent with the previous empirical results.

Secondly, the empirical implication in point (iv) is consistent with cross-country differences in the board composition of publicly traded firms: the fraction of independent outside directors on the board of publicly traded firms is broadly lower in countries where the inside directors of those firms are likely be promoted to the position of CEO, than in countries in which they are unlikely to be promoted to this position.

Thirdly, the empirical implication in point (vi) accords with the results of Mayers, Shivdasani, and Smith (1997) on the role of outside directors in the corporate governance of the US insurance industry. Since ownership rights are not transferable in mutual insurance firms, the effectiveness of external control mechanisms is restricted. Thus, this inalienability increases the importance of monitoring by outside directors in mutual insurance firms. Consistent with the hypothesis, the empirical results of Mayers, Shivdasani, and Smith show that more outside directors are employed in mutual insurance firms than in stock insurance firms. Using a sample of UK companies, O'Sullivan (1997) also gives empirical evidence that outside directors are more likely to be utilized to monitor managers in firms where the effectiveness of external governance mechanisms is restricted. Similar arguments can be applied to managerial and government ownerships in emerging economies. Mak and Li (2001) studied a sample of Singapore-listed firms, and suggested that the proportion of outside directors is

negatively related to managerial and government ownerships.

Finally, although the remaining three empirical implications have not been tested, we think that those implications are not surprising.

#### **4. Robustness and Extensions**

Before we conclude, let us examine how robust our model is to changes in assumptions, and how our model is extended.

##### **4.1. CEO's initial ownership (or option) stake.—**

Thus far, we have not examined what happens if the CEO has a fraction  $\alpha$  of the shares of the firm initially. In this case, the CEO's surplus is  $\Pi_C + \alpha(\Pi_S - r_N)$ , whereas the shareholder's surplus is  $(1 - \alpha)(\Pi_S - r_N)$ . In fact, the CEO's initial holding of the shares of the firm reduces the CEO's compensation so that an increase in the CEO's expected stock income is offset by a decrease in the CEO's expected compensation. Since the CEO's objective function is identical with (9) in this case, the optimal board composition is still determined by (11) even though the CEO has a fraction  $\alpha$  of the shares of the firm from the beginning. These arguments suggest that our results would still hold even if shareholders could be committed to the CEO's compensation scheme before the choice of the composition of the board by the CEO.

##### **4.2. Shareholder activism and the market for corporate control.—**

One could also ask whether our model can be extended in order to consider the impact of shareholder activism and the market for corporate control. The effect of shareholder activism may be interpreted as an increase in the monitoring intensity  $\beta$ . Then, as suggested by Proposition 3(ii), the more intervention by shareholder activism leads to an increase in the fraction of outside directors. It is more complicated to investigate the effect of the market for corporate control because we need to incorporate the process of takeover bidding into the model of the corporate board

such as Hirshleifer and Thakor (1994, 1998).

#### **4.3. Insiders' expert advice.—**

We have assumed that there is a perfect positive correlation between the independence of the board and the amount of value-enhancing activity. In reality, the board of directors not only monitors the CEO but also gives him or her some expert advice on strategic decisions. In particular, if inside directors are senior managers who work for the firm and sit on the board, they are generally well informed about the value of the firm's projects. In this case, the fraction of outside directors on the board is more likely to be lower than that suggested by Proposition 2.

#### **4.4. Private Information about the CEO's type.—**

We have also assumed that the CEO does not know his or her ability. Thus, the CEO is not able to signal his or her ability by choosing the fraction of outside directors. The alternative setting is that the CEO has some positive information about his or her type, and may be able to signal his or her type by choosing the fraction of outside directors. Then, to reveal some of his or her private information, the high ability CEO will select the greater fraction of outside directors on the board than that suggested by Proposition 2, whereas the low ability CEO will be forced to choose the smaller fraction of outside directors on the board than that suggested by Proposition 2.

### **5. Conclusion**

We consider the situation in which the CEO can determine his or her bargaining power endogenously by selecting the independence level of the board members in order to influence the determination of his or her compensation and the effectiveness of monitoring by the corporate board. To this end, we suppose that the CEO has discretion over the choice of the proportion of (truly) independent outside directors

on the board before the CEO compensation contract is determined. This formulation is consistent with the rent extraction view, which regards the compensation contract as an instrument for the CEO to extract rents, and is also consistent with the view that the CEO forces the owners of the firm to pay high compensation by influencing some parameters in the agency problem. We show that the CEO allows the board to be independent to some extent, even though he or she can choose the composition of the board freely. However, the fraction of independent outside directors on the board is less than or equal to  $\frac{1}{2}$ , which is lower than that obtained by the CEO and shareholders' joint surplus maximization problem.

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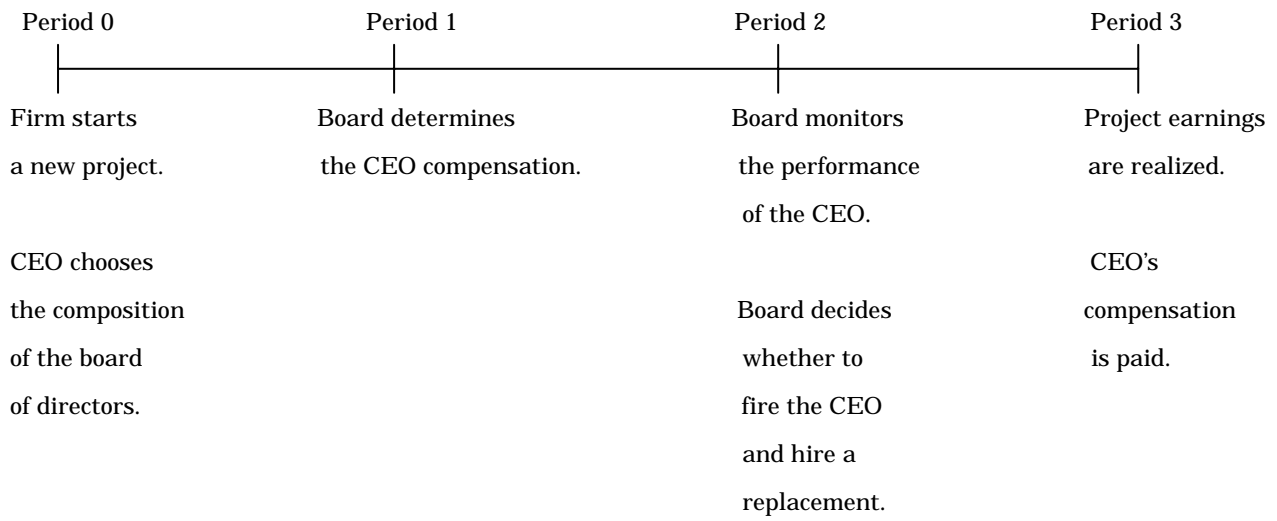


Figure 1. Timing of Events