Trends in Corporate Governance

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Abstract

The popular press and scholarly studies have noted a number of trends in corporate governance. This paper addresses the broad question of whether these trends are linked. And, if so, how? The paper finds that a trend toward greater board diligence will lead to trends toward more external candidates becoming CEO, shorter tenures for CEOs, more effort being expended by CEOs (equivalently less perquisite consumption), and greater CEO compensation.

Keywords: Board of directors, monitoring, CEO tenure and compensation

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1 Introduction

The corporate form has existed for centuries. The East India Company, for example, was chartered by Elizabeth I in 1600 (Baskin and Miranti, 1997). One might imagine, given this long history, that the issue of how corporations should be governed would have been settled some time ago. Yet, for nearly as long as corporations have existed, there have been complaints about corporate governance and agitation to improve it.[1] Moreover, these complaints and agitation do not seem to be purely hot air. Over the centuries, they have led to various changes in corporate law and regulation, including up to the present, with laws such as Sarbanes-Oxley. Even ignoring legally imposed changes, there appear to be ongoing trends in corporate governance.[2]

But what do we make of such trends? If regulatory and other pressures are leading to, say, more diligent boards of directors, what else should we expect to see as consequences? Furthermore, how do the various trends in governance relate to each other? What trends may plausibly be causing other trends? What covariance in trends may simply be spurious? The purpose of this paper is to develop a theoretical framework from in which to answer such questions. This framework allows one, for instance, to trace through the consequences of pressure for greater representation of outsiders on boards for issues such as who gets hired as Chief Executive Officer (CEO), how long he might be expected to serve, and how much he might expect to be paid.[3]

Reflecting the concern of many reform efforts, this paper focuses on the board of directors. While the statutory authority of the board is relative broad, the best empirical evidence indicates that boards play a significant role in only a few corporate decisions (see Hermalin and Weisbach, 2003, for a survey of this evidence). Among those in which the board does play a significant role, the most common—and arguably among the most important—are those decisions

[1] As with much of economics, Adam Smith (1776) appears to have been among the first, complaining that directors of companies cannot be expected to be vigilant monitors and hence, "Negligence and profusion, therefore, must always prevail, more or less, in the management of the affairs of such compan[ies]" (p. 700). One hundred and fifty-six years later, Berle and Means (1932) were likewise complaining. Such complaints are, of course, common in our own day (see Hermalin and Weisbach, 2003, for a survey of current concerns).

[2] See, *e.g.,* "Emerging Trends in Corporate Governance" (Reeves, ed., 2001), a special supplement to *Corporate Board Member* magazine. Empirical scholarly work, discussed *infra*, has also identified trends.

[3] Two points on nomenclature. First, outside directors: Most directors can be classified as *inside* or *outside* directors. Inside directors are employees or former employees of the firm (typically current or former executives of the firm). Outside directors are not employees of the firm (they are, for example, business school deans, prominent citizens, executives at *other* firms, etc.). Outside directors are typically seen as being independent of management (or at least more independent than inside directors). See, moreover, footnote 18 *infra* for further issues connected to independence; also the discussion in Hermalin and Weisbach (2003, p. 8).

The second point is the use of masculine pronouns for the CEO. While a welcome trend in governance is the appointment of more women to the top job, it remains the case that the overwhelming majority of CEOs are men; and I have decided the pronouns issue on the basis of majority rule.

pertaining to the selection, monitoring, and retention (or dismissal) of the CEO (see, *e.g.,* Mace, 1971, and Vancil, 1987, for discussion; see also Weisbach, 1988, for statistical evidence). Consequently, the basic model developed here is one in which the board makes a decision about whom to hire; a subsequent decision about how intensely to monitor him; and, depending on what it learns from its monitoring, a final decision about retaining him or firing him. Section 2 sets out this basic model, while Section 3 analyzes it.

Initially, the choice of whom to hire is between an internal candidate and an external candidate. The primary difference between these candidates is that less is known about the external candidate, which translates into his ability being estimated with less precision than the internal candidate's. Because the board has the option to dismiss the CEO, it values uncertainty about the CEO's ability (it enjoys the upside potential, but can largely escape the downside risk). This makes external candidates more desirable *ceteris paribus*. This desirability increases, the more likely it is that the board will be in a position to exercise its option, which, in turn, is more likely the more diligently it monitors the CEO. Hence, if there is a trend toward greater board diligence, then there should be a corresponding trend toward more frequent external hires as CEOs.

Because the probability of dismissal increases with the intensity of board monitoring, a straightforward prediction of the model is that greater board diligence should lead to shorter CEO tenures on average. This effect is strengthened in an indirect way: Because greater diligence increases the option value of a new CEO, increased diligence makes boards more willing to tradeoff a higher estimated ability for greater uncertainty about ability. Hence, the average estimated ability of CEOs *hired* should decrease as board diligence increases. Given that the sample of hired CEOs is of lower average quality, their tenure should be correspondingly lower on average as well. Depending on the underlying distribution of estimated abilities in the populations of internal and external candidates, this last insight plausibly suggests that external candidates' expected tenure as CEO will be less than internal candidates'.

In the initial model and analysis (Sections 2–4), the question of whether the CEO expends effort is ignored. In Section 5, the issue of CEO effort is considered (alternatively and equivalently, the CEO's decision to forgo consumption of perquisites).[4] A consequence of greater board diligence with respect to monitoring is an increase in CEO effort. At first, this might seem like a "no-brainer" conclusion, but it does, in fact, involve some subtlety. In this model, monitoring reveals *nothing* about CEO effort in equilibrium. The board monitors because it wants to improve its estimate of the CEO's inherent ability, not learn how much effort he has or hasn't expended. Yet, because the CEO's effort can affect the inferences the board draws, the CEO has an incentive to increase his effort in hopes of raising the board's estimate of his ability (in equilibrium, his hopes go unrealized because the board can subtract out the equilibrium level of effort from the signal it observes). The CEO's incentives to increase effort are greater the more likely it is that the board will make a decision about retaining him

[4] I thank John Morgan for suggesting this section be added.

based on its inference of his ability; and this likelihood is, in turn, an increasing function of the board's diligence.

If the consequence of a more diligent board is to make the CEO work harder in equilibrium, then the CEO's equilibrium utility will have fallen and he will presumably demand compensation for this. Indeed, even without the issue of CEO effort, greater board diligence translates into lower expected utility for the CEO *ceteris paribus*. Hence, as spelled out in Section 6, a prediction of the model is that a trend towards greater board diligence should lead to a trend toward greater CEO compensation.

This prediction about the time-series correlation between board diligence and executive compensation would seem at odds with the view, expressed for example by Bebchuk and Fried (2003), that it is *weak* boards that tend to "overpay" their CEOs. As I show in Section 6, an inverse relation between board diligence and CEO compensation can exist in cross-sectional data even though the two variables positively covary in time-series data: Board diligence and CEO ability are, in a sense, substitutes. Hence, it could be the less diligent boards that have the stronger demand for the CEOs with the higher estimated ability. Because such "star" CEOs command, not surprisingly, a wage premium, it could well be the less diligent boards that are the ones which hire the more expensive CEOs.[5] But as all boards become more diligent, the compensation-for-increased-disutility effect leads to an overall trend toward higher CEO compensation.

The framework presented here offers a means of tying together a number of trends in corporate governance. By and large its predictions coincide with the existing empirical evidence and the model makes some predictions that have not yet been tested (*e.g.,* the possibility that CEOs hired from the outside have, on average, shorter tenures than those hired from the inside). Yet, like any economic model, it has its limits. Many of these limitations are discussed in the course of the paper, but a few are best left for discussion at the end (Section 7).

2 Model

2.1 Timing

The model has the following timing.

STAGE 1. At the start, a board of directors needs to hire a new CEO for the firm. It has a choice of an internal candidate (subscript I) or an external candidate (subscript E). There are *commonly* held prior distributions about the ability, α, of each candidate. Specifically, α is distributed normally with mean μ (μ_E for the external candidate and μ_I for the internal candidate) and variance $1/\tau$ (τ is the *precision* of the distribution; τ_E for the external

[5] The bargaining model of Hermalin and Weisbach (1998) offers an alternative explanation for a negative covariance between board diligence and CEO compensation in cross-sectional data: Better CEOs have more bargaining power *vis-à-vis* the board and are, thus, able to get more of what they want: less scrutiny from the board and higher pay. That is, in the Hermalin and Weisbach model, the negative correlation between board diligence and CEO compensation is spurious—both variables are driven by CEO ability.

candidate and τ_I for the internal candidate). Reflecting that more is generally known about how an internal candidate will do as CEO than about how an external candidate will do, assume

$$\tau_I > \tau_E \,.$$

STAGE 2. The board may acquire a private signal, y, about the CEO it has hired. The probability that the board acquires this signal depends on the intensity with which it monitors the CEO. The signal is distributed normally with a mean equal to the CEO's ability, α, and a variance equal to $1/s$. The precision s is the same regardless of which candidate became CEO.

STAGE 3. If the board obtains the signal, it updates its estimate of the CEO's ability. Based on this posterior estimate, the board may decide to fire the CEO and hire a replacement. A replacement CEO's ability, α_R, represents a random draw from a normal distribution with mean $\mu_R = 0$ and variance $1/\tau_R$. Setting μ_R to zero is a convenient normalization without loss of generality. Because what is of the interest is the board's replacing the incumbent CEO in response to a bad signal, assume neither μ_E nor μ_I is less than zero (were μ_E or $\mu_I < 0$, then the incumbent CEO would lose his job both when a bad signal is obtained and when no signal is obtained). The assumption that the mean ability of a replacement CEO is lower than the (unconditional) mean ability of an incumbent can be justified as follows: Firing the CEO "early" triggers a succession before the normal transition process will have run; hence, the pool of candidate successors is likely weaker than it would be in a normal succession process. A complementary justification is that μ_R is the expected value of the firm under a caretaker administration that is not (fully) able to pursue new initiatives or respond aggressively to changes in the strategic environment.[6] Along these same lines, a further justification is that μ_R represents the expected ability of a new CEO *minus* such disruption costs.[7]

STAGE 4. Earnings, x, are realized. Earnings are distributed normally with a mean equal to the ability of the CEO in place (the one hired in stage 1 or his replacement if he's replaced in stage 3). The random variables $y - \alpha$ and $x - \alpha$ are independently distributed.

2.2 Preferences and Ability

A CEO's ability is fixed throughout his career. I follow Holmstrom (1999) by assuming that CEOs and boards are symmetrically informed; in particular, both parties know only that the CEO's ability is drawn from a normal distribution with mean μ and precision τ. This assumption can by justified by noting that

[6] Eldenburg et al. (2003) find evidence that, in hospital CEO transitions, caretaker administrations are appointed with some frequency.

[7] See Vancil (1987) for a discussion of the benefits of an orderly transition process.

a critical component about a CEO's ability is the match between him and the job of being CEO, about which both parties are likely to be equally uncertain. Moreover, both parties are likely to have similar knowledge of those aspects of ability revealed by prior work experience.

I assume that individual directors like higher earnings, but find monitoring to be costly; where monitoring is defined as the efforts made to acquire the signal y.[8] Following Hermalin and Weisbach (1998), I assume the preferences of the individual directors can be aggregated in such a way that the board acts as if it has a single utility function that positively weights earnings, but negatively weights efforts to monitor. Such monitoring efforts can be translated, without loss of generality, into the probability—denoted by p—that the board acquires the signal y. Assume further, as in Hermalin and Weisbach (1998), that the board's utility function is additively separable:

$$U(x,p) = \theta x + (1-\theta)\big(-c(p)\big)\,, \tag{1}$$

where $c(p)$ denotes the cost or disutility incurred by the board and θ and $1-\theta$ are the weights on the two components. Because utilities are defined up to an affine transformation only, there is no further loss of generality in re-expressing (1) as

$$\delta x - c(p)\,, \tag{2}$$

where $\delta > 0$ is a measure of the board's *d*iligence or independence.[9] Assume that $c(\cdot)$ is strictly increasing for $p > 0$, strictly convex, and twice-differentiable. The factor δ is meant to capture those aspects of the board that affect how it weighs the cost of monitoring versus the higher profits that such monitoring can provide. This factor would, for instance, be expected to vary *in*versely with (i) the proportion of inside directors on the board—insiders presumably have reasons to dislike monitoring themselves or their boss, the CEO; (ii) the opportunity cost of the directors' time; (iii) directors' incentives not to "rock the boat" (*e.g.,* to increase their chances for additional directorships with other firms); and (iv) the strengths of the personal ties between directors and the CEO.

2.3 Updating Beliefs and Optimal Monitoring

If the board obtains the signal, y, the posterior distribution of the CEO's ability is normal with mean $\hat{\mu}$ and precision $\hat{\tau}$, where

$$\hat{\mu} = \frac{\tau\mu + sy}{\tau + s} \text{ and } \hat{\tau} = \tau + s$$

(see, *e.g.,* DeGroot, 1970, p. 167).

[8] This monitoring need not be particularly "active"; one could as easily interpret it as taking the effort to be attentive to the performance of the firm and making an effort to seek from the data made available to the board information relevant for estimating the CEO's ability.

[9] That is, (2) is (1) divided by $1-\theta$.

Observe that the expected value of earnings, x, is the expected value of the CEO's ability. Therefore, it is $\hat{\mu}$ if a signal is obtained and the incumbent CEO is retained; μ if no signal is obtained and the incumbent CEO is retained; and $\mu_R = 0$ if a replacement CEO is hired. By assumption $\mu_I \geq 0$ and $\mu_E \geq 0$, so, conditional on no signal being obtained, the board maximizes firm expected earnings by retaining the incumbent CEO. If a signal is obtained, then expected earnings are maximized by firing the incumbent CEO and hiring a replacement if and only if $\hat{\mu} < 0 = \mu_R$. Hence, the rule for replacing the incumbent CEO is to replace him if and only if the signal y satisfies

$$y < -\frac{\tau\mu}{s} \equiv Y\,. \tag{3}$$

Note Y is the cutoff value for the signal, below which the incumbent loses his job.[10]

The distribution of the signal y given the CEO's *true* ability, α, is normal with mean α and variance $1/s$; hence, the distribution of y given the *prior estimate* of the CEO's ability, μ, is normal with mean μ and variance $1/s + 1/\tau$.[11] Define

$$H = \frac{s\tau}{s+\tau}$$

to be the precision of y given μ.

The firm's expected earnings if it *will* learn y are

$$V \equiv \int_{-\infty}^{\infty} \max\left\{0, \frac{\tau\mu + sy}{\tau + s}\right\} \sqrt{\frac{H}{2\pi}} e^{-\frac{H}{2}(y-\mu)^2} dy\,.$$

The option to fire the incumbent CEO is a valuable one, hence $V > \mu$ for all τ.

A change of variables from y to $z \equiv \sqrt{H}(y-\mu)$ reveals that V can be written as

$$\begin{aligned} V &= \mu\left[1 - \Phi\big((Y-\mu)\sqrt{H}\big)\right] + \frac{\sqrt{H}}{\tau}\phi\big((Y-\mu)\sqrt{H}\big) \\ &= \mu\Phi\big(-(Y-\mu)\sqrt{H}\big) + \frac{\sqrt{H}}{\tau}\phi\big((Y-\mu)\sqrt{H}\big)\,, \end{aligned}$$

where $\Phi(\cdot)$ is the distribution function of a standard normal random variable (*i.e.,* with mean zero and variance one), $\phi(\cdot)$ is its corresponding density function, and the second line follows from the first because the standard normal is symmetric about zero. Note that

$$\Phi\big(-(Y-\mu)\sqrt{H}\big) \tag{4}$$

is the probability that the CEO will be retained if a signal is obtained.

[10] As a convention, functions of many variables, such as Y, will be denoted by capital letters.

[11] The random variable $y - \mu$ is the sum of two independently distributed normal variables $y - \alpha$ and $\alpha - \mu$; hence, $y - \mu$ is also normally distributed. The means of these two random variables are both zero, so the mean of y given μ is, thus, μ. The variance of the two variables are $1/s$ and $1/\tau$ respectively, so the variance of $y - \mu$ and, therefore, y given μ is $1/s + 1/\tau$.

3 Analysis

In deciding how intensely to monitor the CEO (*i.e.,* what p to choose), the board solves

$$\max_{p\in[0,1]} \delta\big(pV + (1-p)\mu\big) - c(p)\,. \tag{5}$$

This expression is global concave in p. For convenience, attention will be limited to cases in which (5) has an interior solution.[12] The first-order condition for (5),

$$\delta(V-\mu) - c'(p) = 0\,, \tag{6}$$

is sufficient, as well as necessary, and admits a unique solution. Let P^* be the solution to (6). Properties of P^* are:[13]

Proposition 1 *The intensity with which the board monitors the* CEO*, P^*, is*

(i) decreasing with the prior estimate of his ability, μ;

(ii) decreasing with the precision of the prior estimate, τ; but

(iii) increasing with the board's diligence or independence, δ.

One way to interpret Proposition 1 is in terms of the gain from obtaining a signal about the CEO, which is $V-\mu$ (this is, essentially, the marginal return to monitoring, p, see (6)). The marginal value of the signal increases the greater is the likelihood it will be decisive with regard to whether the CEO is retained or fired. If the prior about the CEO's ability is high, then the signal is less likely to be decisive. Similarly, if the precision of that prior estimate is high, then the signal is less likely to be decisive. Because the board will rationally monitor less the lower is the value of the signal, these insights explain results (i) and (ii) of Proposition 1.

The next set of questions has to do with whether the board hires the internal or external candidate in stage 1:

Proposition 2 *Fix $\tau_I > \tau_E$ and define $\Delta = \mu_I - \mu_E$. Then for a given μ_E (or μ_I) there exists a minimum $\Delta_m > 0$ such that the external candidate is hired if and only if $\Delta < \Delta_m$. Moreover, Δ_m increases as the board gains independence (i.e., the greater is δ); that is, more independent boards are more inclined to hire external candidates ceteris paribus.*

[12] The analysis is readily extended to allow for corner solutions, but little is gained by considering them and excluding them simplifies the analysis. A condition that would insure an interior solution for all parameter values is

$$c'(0) = 0 \text{ and } \lim_{p\uparrow 1} c'(p) = \infty\,.$$

[13] All proofs may be found in the appendix.

Corollary 1 *A necessary condition for the internal candidate to be hired is that his estimated ability be strictly greater than that of the external candidate (i.e., that $\mu_I > \mu_E$).*

Corollary 1 may, at first, seem surprising. After all, we often think of internal candidates having the inside track rather than facing a higher hurdle than external candidates. To understand why internal candidates are not advantaged—indeed, are disadvantaged—recall that an external candidate's ability is less well estimated than an internal candidate's. This greater uncertainty about the external candidate means that he has the greater option value *ceteris paribus*; which in turn makes him the more desirable candidate *ceteris paribus*. For the internal candidate to be competitive, he must, therefore, have a higher estimated ability than the external candidate.

The second half of Proposition 2 follows because the more independent the board is (*i.e.,* the greater is δ), the more intensely it monitors (*i.e.,* the greater is p, see Proposition 1). In turn, this means that a more independent board is more likely to be in a situation to exercise the option of dismissing the CEO; which in turn raises the importance it places on having that option. Consequently, the value of the external candidate is greater *vis-à-vis* the internal candidate *ceteris paribus*; hence, the higher-ability hurdle for the internal candidate goes up.

The second half of Proposition 2 implies that more independent boards—or boards otherwise more disposed toward monitoring—will be more likely to hire external candidates than less independent boards—or boards otherwise less disposed toward monitoring. Given the perceived wisdom that outside directors are more independent or otherwise more inclined to monitor,[14] this suggests that the tendency to hire external candidates increases with the proportion of outside directors on the board. This prediction is consistent with the empirical findings of Borokhovich et al. (1996) and Dahya and McConnell (2001), who find evidence in support of this hypothesis using US and UK data, respectively.

Furthermore, controlling for the level of board independence, δ, internal candidates and external candidates will be treated differently if hired as CEOs. From Corollary 1, an internal candidate who gets the job must have a higher estimated ability, μ_I, than an external candidate. Moreover, there is less uncertainty about an internal candidate's ability than about an external candidate's ($\tau_I > \tau_E$). These differences result, therefore, in different levels of monitoring and, thus, different probabilities of dismissal.

Proposition 3 *Fix the board's level of independence, δ. Suppose the board is indifferent between hiring the external candidate or the internal candidate as* CEO*. Then, if the external candidate is hired,*

(i) he is more intensely monitored than the internal candidate would have been (i.e., $P_E^* > P_I^*$);

[14] See Weisbach (1988) for evidence that outside directors could be more inclined to monitor. Specifically, Weisbach finds that, as the proportion of outside directors on a board increases, the board has a greater tendency to exhibit behavior consistent with monitoring.

(ii) he is more likely to be dismissed than the internal candidate would have been conditional on being monitored (i.e., conditional on the signal y being obtained); and, hence,

(iii) he has a shorter expected tenure than the internal candidate would have been expected to have (i.e., is less likely to reach stage 4).

Result (i) of Proposition 3 follows immediately from Proposition 1 because the prior estimate of an external candidate's ability is both lower and estimated with less precision than is the estimate of an internal candidate's ability. The fact that the signal is less decisive *vis-à-vis* dismissal both when the prior estimate is high or the precision of that estimate is high means that the board is less responsive to a low value of the signal for an internal candidate than for an external candidate, which explains result (ii) of Proposition 3. If the board is both more likely to monitor a CEO hired externally and more likely to respond to the signal gained from that monitoring by firing him, then his expected tenure must be less than a CEO hired from the inside; that is, result (iii) of Proposition 3 follows immediately from results (i) and (ii).

Because Proposition 3 involves a counter-factual comparison—what would have been the treatment of the not-hired internal candidate—it is not readily tested empirically. It can, however, be turned into a more testable hypothesis if one is willing to make assumptions about the underlying distributions of the estimated abilities of the two types of candidates (*i.e.,* the underlying distributions of μ_I and μ_E). If the two distributions are similar to each other, then internal candidates who become CEO will tend to have higher estimated abilities than external candidates who become CEO *ceteris paribus*. The three results in Proposition 3 clearly hold whenever comparing candidates for whom $\mu_I \geq \mu_E$. Consequently, a potential prediction of this analysis is that, controlling for board independence, CEOs who were hired from the outside will tend to have shorter tenures than CEOs who are hired from the inside.

It is important to recognize that this prediction relies on the underlying properties of the distributions of the estimated abilities. If the distributions are sufficiently *dis*similar in specific ways, then this prediction will not be borne out in the data. For instance, suppose that the distribution of μ_E were such that the vast majority of realized μ_Es were generally much less than the majority of realized μ_Is, so that the internal candidate is highly likely to win. However, assume further that there is a small mass of exceedingly talented external candidates for whom $\mu_E \gg \mu_I$ relative to the bulk of the internal candidates. Then, comparing the distributions of the μs for *winning* candidates, μ_E will tend to be much larger than μ_I, perhaps to the extent that winning external candidates receive less scrutiny than winning internal candidates (*i.e.,* the "ability" result, part (i) of Proposition 1, outweighs the "uncertainty" result, part (ii) of Proposition 1). Figure 1 illustrates such a hypothetical situation, with panel A showing the underlying distributions of the estimated abilities and panel B showing those distributions conditional on winning the job.

If one imagined that there was an essentially common market for external candidates, then the variation in the estimated abilities of external candidates

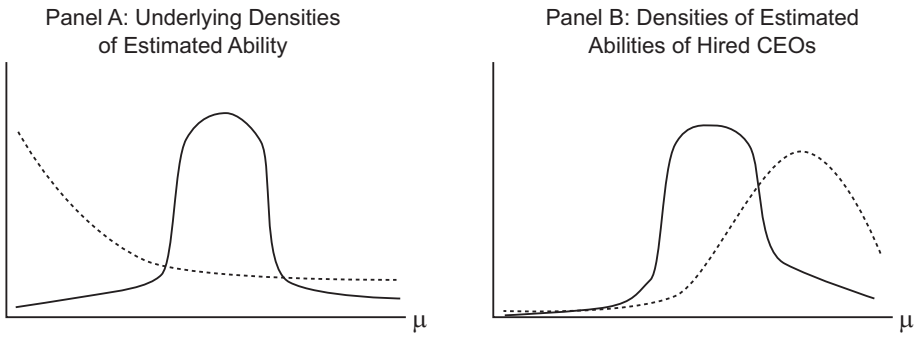

Figure 1: Hypothetical distributions of estimated abilities for internal candidates (solid curves) and external candidates (dashed curves). Panel A shows the underlying densities of μ_I and μ_E respectively, while Panel B shows the resulting densities *conditional on being hired* as CEO. With such hypothetical distributions as Panel A, those external-candidate CEOs who do get hired could actually have *longer* expected tenures than internal-candidate CEOs.

across firms would be relatively small (indeed, there would be no variation if all firms faced the same external pool). Hence, one could, as an approximation, take μ_E to be a constant for the economy. All the variation would, then, be in the quality of the internal candidates. In such a world, one would, then, get the following testable corollary to Proposition 3:

Corollary 2 *Assume that μ_E is fixed across firms, but there is variation in μ_I among firms selecting a new* CEO*. Then, controlling for board independence, δ,* CEO*s hired from the outside will have shorter tenures on average than* CEO*s hired from the inside.*

It is important to remember that the conclusion of Corollary 2 (or any statement similar to it) is dependent on assumptions concerning the underlying distributions of talent in the internal and external candidate pools (recall the discussion surrounding Figure 1). There are two other, empirical, reasons that the prediction of Corollary 2 may be difficult to find in the data:[15] First, firms often hire heir-apparents from the outside a few years in advance of making them CEO,[16] which muddies the distinction between internal and external candidates, creating data-definition problems for the econometrician. A second difficulty is

[15]To the best of my knowledge, no one has tested whether CEOs hired from the outside tend to have shorter tenures than CEOs hired from the inside controlling for board characteristics.

[16]For example, in 1997, Avon hired Charles Perrin, former CEO of Duracell, to be the heir apparent to James Preston. Perrin became CEO in 1998. Hayes et al. (2003, Table 1) report that 22% of new CEOs have less than five years experience with the company they've been appointed to lead.

that firms sometimes employ interim CEOs, particularly following unexpected CEO departures, who are almost invariably insiders, but, by definition, will have short tenures;[17] which also raises data-construction issues.

The discussion of potentially different tenures for external CEO hires and internal CEO hires has so far controlled for the level of board independence (measured, possibly, by proportion of outside directors). If one "drops" that control, then Proposition 2, which predicts that more independent boards will be more inclined to hire external CEO candidates, and result (iii) of Proposition 1, which predicts that such boards will monitor more, offer an additional factor—beyond the one identified in Corollary 2 and connected discussion—for why external hires could be expected to have shorter tenures than internal hires; namely external hires are more likely to have been hired by boards more inclined to monitor and, thus, more inclined to dismiss a CEO early (*i.e.,* before stage 4). Again, however, the underlying-distributions and data-definition issues raised above could create problems for verifying this prediction in the data.

4 Trends

As the analysis of the previous section makes clear, changes in the parameter δ will have clear effects on the selection, monitoring, and replacement of CEOs. Huson et al. (2001) note a number of trends that could correspond to an upward trend in δ (*i.e.,* toward a greater willingness of boards to monitor):

1. The proportion of outside directors on boards has steadily increased in the US and in other countries. Hermalin and Weisbach (1988, p. 593) report an increase in the average percentage of outside directors on boards from 37.6% to 53.9% over the period 1971 to 1983 for a sample of 142 NYSE-traded companies. Borokhovich et al. (1996, Table 1) report an increase from 68.3% to 75.6% over the period 1970 to 1988 for their sample of 588 large public firms.[18] Huson et al. cite evidence that the percentage of manufacturing firms with a majority of outside directors increased from 71% in 1972 to 86% in 1989. In a sample of 700 firms listed on the London Stock Exchange, Dahya and McConnell (2001, Table 2) find the average percentage of outside directors increased from 35% in 1989 to 61% in 1999. Perceived wisdom is that outside directors are more inclined to monitor

[17] Eldenburg et al. (2003), for instance, found numerous examples of hospitals employing interim CEOs.

[18] The large discrepancy in Hermalin and Weisbach and Borokhovich et al.'s figures, despite their considering overlapping periods, is due in small part to differences between their samples and in large part to differences in how the two sets of authors define outside directors. The Hermalin and Weisbach definition of outsider *excludes* directors who, while not management of the company, are not likely to be independent of management (*e.g.,* family members of the CEO, people with significant business dealings with the company, etc.). Hermalin and Weisbach refer to such directors as "grey" directors. Borokhovich et al. essentially count grey directors as outside directors. Using Borokhovich et al.'s definition, Hermalin and Weisbach's data reveal an increase in outsiders from 50.9% to 65.7%.

the CEO than are inside directors (see, *e.g.,* Weisbach, 1988, for evidence). Hence, these trends toward greater outsider representation on boards can be seen to correspond to a trend toward higher δs among firms.

2. In addition, Huson et al. cite evidence that the use of incentive compensation for outside directors has increased considerably: In a Conference Board survey of US firms taken in 1989, six percent made stock grants to outside directors and 14 percent granted stock options. In 1997, 84% of firms in the survey were utilizing stock-based compensation for their outside directors. Because δ can be seen as the weight assigned greater profits relative to the cost of monitoring, an increase in incentive pay for directors can be viewed as increasing δ; that is, increasing the willingness to monitor.

3. The trend toward greater outsider representation on boards and more board independence could be attributable to public, exchange, and governmental pressure. For instance, Huson et al. report that, in 1978, the NYSE required listed firms to have audit committees consisting solely of outside directors. Dahya and McConnell document the effect the Cadbury report, issued in 1992, had on the subsequent increase in outsider representation on UK boards.

4. In the US, at least, these trends could also be attributable, in part, to the increase in institutional stock ownership. Huson et al. report that the percentage of US equity held by institutional investors[19] has increased from 20% of outstanding equity held by US investors in 1971 to nearly 45% by 1994 (Figure 1 of Huson et al.). As Huson et al. discuss, institutional owners tend to be more active in governance matters, and hence they tend to encourage governance practices consistent with higher δs. Gillan and Starks (2000), for instance, find evidence that, in the early 1990s, institutional investors put pressure on firms to increase board independence through the stockholder proxy proposal process. Hence, the overall trend toward greater institutional investment could lead to a trend toward higher δs.

If, as hypothesized, these trends correspond to the parameter δ increasing over time, then the analysis of the previous section leads to the following predictions:

Proposition 4 *As δ increases across firms,*

(i) the proportion of new CEO*s who are hired from the outside should increase; and*

(ii) the expected tenure of CEO*s should become shorter.*

[19] Defined as mutual funds, private pension funds, government pension funds, and insurance company holdings.

Result (i) of Proposition 4 is essentially a restatement of the second half of Proposition 2. Consistent with Proposition 4, Borokhovich et al., Huson et al., and Dahya and McConnell find empirical evidence of a trend toward outsiders' being appointed CEO with increased frequency, coinciding with the aforementioned trends in better governance (higher δs).

Result (ii) of Proposition 4 follows from result (iii) of Proposition 1: An increase in δ leads to more monitoring of the CEO, regardless of whether he was an internal or external candidate. Moreover, an increase in δ leads to marginally more external candidates being hired (Proposition 2) and because these marginal candidates are beating out internal candidates who would otherwise have become CEOs, they are more heavily monitored (Proposition 3), which further contributes to shorter CEO tenures. Huson et al. find evidence consistent with result (ii) of Proposition 4: Firings, as a percentage of all CEO successions, has been trending upward over the period 1971 to 1994 (see Table II of Huson et al.).

5 An Extension: CEO Effort

To this point, the CEO has been implicitly assumed to expend no effort. To consider the issue of effort, suppose that after he is hired in stage 1, but before the board observes the signal (if it does at stage 2), the CEO can expend effort e at cost $k(e)$ to him. Assume that $k'(0) = 0$, $k'(e) > 0$ for $e > 0$, and that $k(\cdot)$ is strictly convex. Assume that the CEO's utility is $b - k(e)$ if he survives to the end (*i.e.,* stage 4), but $-k(e)$ if he doesn't survive (*i.e.,* is dismissed in stage 3). The parameter $b > 0$ is a measure of the benefit the CEO derives from retaining his office. Take it to be fixed exogenously. Assume the CEO's choice of e is his private information (*i.e.,* it is a hidden action).

Assume that there are two consequences to the CEO's effort. First, it enhances the firm's value by $\beta(e)$, where $\beta(\cdot)$ is an increasing function.[21] Second, it affects the signal observed by the board; specifically, instead of observing y, the board now observes $y + e \equiv \tilde{y}$. Assume that the enhancement to firm value is realized (or, at least, learned by the board) *after* it must make its decision to retain or fire the CEO (*i.e.,* after stage 3). This last assumption precludes the board from using the enhancement in firm value to estimate e.

Because the board wishes to base its firing decision on y, it would subtract e from $\tilde{y}$ if it knew e. It cannot, in fact, do this, because, by assumption, it does not know e. *If,* however, the CEO plays a pure-strategy in equilibrium, then the board can, nonetheless, infer what e should be in equilibrium. Let $\hat{e}$ denote this inferred or estimated level of e under the presumption that the CEO plays a pure strategy. The board will then base its firing decision on $\tilde{y} - \hat{e} = y + e - \hat{e}$. The same replacement rule as before—expression (3)—applies, so the CEO loses his job if and only if

$$\tilde{y} - \hat{e} < -\frac{\tau\mu}{s} \equiv Y\,. \tag{7}$$

[21] Alternatively and equivalently, $\beta(e)$ is the expectation of enhanced value conditional on e.

Note that the Y in (7) is the same as in (3). This cutoff rule can be reexpressed as the CEO loses his job if and only if

$$y < Y + \hat{e} - e\,.$$

Therefore, using (4), the CEO's expected utility as a function of e is

$$\Big(P^*\Phi\big(-(Y+\hat{e}-e-\mu)\sqrt{H}\,\big)+(1-P^*)\Big)\,b-k(e)\,. \tag{8}$$

The CEO chooses e to maximize (8) given the value of $\hat{e}$ he anticipates the board has. The first-order condition is

$$bP^*\phi\big(-(Y+\hat{e}-e-\mu)\sqrt{H}\,\big)\sqrt{H}-k'(e)=0\,. \tag{9}$$

In a pure-strategy equilibrium, the board must correctly anticipate the CEO's effort; that is, $\hat{e}=e$ in equilibrium. The equilibrium value of effort, e^*, is, therefore, the solution to

$$bP^*\phi\big(-(Y-\mu)\sqrt{H}\,\big)\sqrt{H}-k'(e^*)=0\,. \tag{10}$$

Because $k'(\cdot)$ is strictly monotonic, with a range of $[0,\infty)$, a unique e^* exists that solves (10). In other words, *if* a pure-strategy equilibrium exists, then it is unique and, in it, the CEO supplies effort e^*.

The only step thus remaining is to establish that a pure-strategy equilibrium exists, which entails verifying that e^* is a best response for the CEO when the board believes he will supply effort e^*. Unfortunately, without imposing further structure on the model, there is no guarantee that a pure-strategy equilibrium exists: While it can be shown that $e=e^*$ achieves a *local* maximum of the CEO's expected utility when $\hat{e}=e^*$,[22] it is not possible to show that is a *global* maximum. Panel A of Figure 2 illustrates what can "go wrong": In addition to the local maximum at $e=e^*$, there is also a local maximum at $e=e_0$, with the latter representing the global maximum. On the other hand, a pure-strategy equilibrium can exist—such an equilibrium is illustrated in Panel B of Figure 2.

An analysis of this game when no pure-strategy equilibrium exists is quite involved and would take us too far afield. Hence, attention will be limited to situations in which the pure-strategy equilibrium does exist.

Proposition 5 *Assume for the relevant parameter values that the game with* CEO *effort has a pure-strategy equilibrium. Then the following comparative statics hold:*

[22] The CEO's marginal benefit of effort can be shown to be

$$bP^*\sqrt{H}\phi\left[\left(\frac{s+\tau}{s}\mu+e-e^*\right)\sqrt{H}\right]\,.$$

Because $\mu>0$ the expression in square brackets is in the right tail of the normal density for $e\in(e^*-\varepsilon,\infty)$, where $\varepsilon>0$ is not to large. Because the normal density is shrinking as one moves further out the right tail, it follows that this marginal benefit is downward sloping in e in the neighborhood of e^*. Marginal cost, $k'(e)$, is upward sloping. Hence, at $e=e^*$ marginal benefit intersects marginal cost from above; that is, $e=e^*$ is a local maximum.

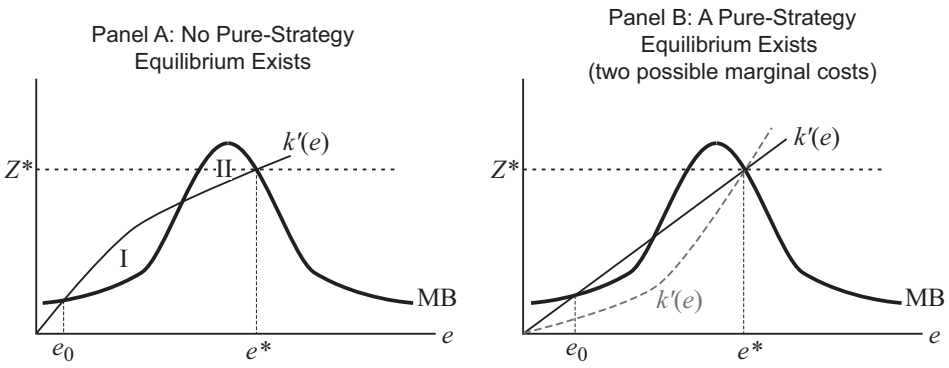

Figure 2: Scenarios in which a pure-strategy equilibrium does not exist (Panel A) and does exist (Panel B). In both panels

$$\text{MB} = bP^*\phi\big(-(Y+e^*-e-\mu)\sqrt{H}\,\big)\sqrt{H}$$

and

$$Z^* = bP^*\phi\big(-(Y-\mu)\sqrt{H}\,\big)\sqrt{H}$$

(*i.e.,* Z^* is the first term in (10)). In Panel A, there are two local maxima, one at e_0 and one at e^*. The one at e_0 is, however, the global maximum (best response) because, were the CEO to switch to e^*, he would lose the area labeled I, which is larger than the area he would gain, labeled II. In contrast, in Panel B, it is e^* that is the global maximum. Panel B also shows an alternative marginal cost (the dashed grey curve) in which e^* is the sole (and, thus, global) maximizer.

(i) the lower the CEO*'s estimated ability, the more effort he expends in equilibrium; and*

(ii) the more diligent is the board (i.e., the greater is δ), the more effort the CEO *expends in equilibrium.*

Result (i)—the "Avis effect"[23]—predicts that CEOs with lower estimated abilities will work harder than CEOs with higher estimated abilities *ceteris paribus*. Intuitively, the marginal benefit of trying to boost the signal the board receives if it monitors is greater both the more likely it is that the board monitors (*i.e.,* the greater is P^*) and the more likely it is that the board responds to a low value of the signal by dismissing the CEO (*i.e.,* the lower is Φ). Because the board is both more likely to monitor and more likely to respond to the signal by dismissing the CEO, the lower is his estimated ability, the result follows.[24]

Result (ii) predicts that the more diligent a monitor the board is, the harder the CEO works. At first glance, this may seem such an "obvious" result that it hardly warrants attention. Yet, the *mechanism behind* this result is not necessarily obvious. Remember the board is *not* monitoring the CEO's effort; indeed, it cannot observe that effort within the time period in which it must make a decision about retaining him or letting him go. Rather the impact monitoring has on effort is indirect: Because the board seeks evidence about the CEO's ability—not how hard he has worked—the CEO has an incentive to try to influence that signal by working harder. The more likely the board is to seek this evidence (*i.e.,* the greater is δ), the stronger this incentive is. In equilibrium, the board anticipates that the CEO will do this—and the more so the more diligent it is about monitoring—so it correspondingly discounts the signal it observes (subtracts e^* from it). Even though no one is fooled in equilibrium, the CEO is compelled to supply e^* in effort or otherwise risk increasing his odds of being fired.

Consequently, result (ii) can be seen as being in the spirit of Fama (1980), which argues that a manager's concern for his reputation in the labor market will cause him to work hard. Here, it is not an external labor market that the CEO seeks to influence, but his own board of directors. It is also true, however, that while this concern with influencing the board can help to ameliorate the hidden-action problem that exists, there is no reason to expect it to be a particularly effective solution insofar as the CEO's marginal-benefit schedule (the first term in expression (10)) does not match—except, possibly, by the most random of coincidences—the shareholders' marginal-benefit schedule, $\beta'(e)$ (Holmstrom makes a similar point about mis-matched incentives in his critique of Fama).

[23] In the 1960s the Avis car rental company launched an ad campaign with the slogan "We're number two, we have to try harder." "We try harder" is still Avis's world-wide slogan.

[24] A theoretical possibility in this model is that the Avis effect could outweigh the direct effect of a more able CEO such that the board prefers to hire CEOs with lower estimated abilities versus CEOs with higher estimated abilities. It seems unlikely that such a curious result would govern actual CEO-succession decisions.

In equilibrium, the CEO's expected utility is

$$\Big(P^*\Phi\big(-(Y-\mu)\sqrt{H}\,\big)+(1-P^*)\Big)\,b-k(e^*)\,. \tag{11}$$

Differentiating (11) with respect to board diligence, δ, yields

$$\frac{\partial P^*}{\partial\delta}(\Phi-1)b-k'(e^*)\frac{\partial e^*}{\partial\delta}\,,$$

which is negative because both partial derivatives are positive by Propositions 1 and 5, respectively, $\Phi<1$, and $k'>0$. Hence, the CEO's expected utility is falling as the board becomes more diligent. If, as seems reasonable, the CEO needs to be compensated for this loss in utility, then a consequence of a more diligent board is an increase in CEO compensation. To summarize:

Proposition 6 *If* CEO*s with similar attributes enjoy equal expected utility in the equilibrium of the* CEO *market, then, controlling for attributes,* CEO*s who work for more diligent boards will receive greater compensation than* CEO*s who work for less diligent boards.*

Proposition 6 possibly offers some insight into the upward trend in executive compensation much decried in the popular press and among many in the public, and which has been widely documented in the economic literature (see, *e.g.,* Hall and Liebman, 1998, Table IIa, which documents a 97.3% increase in average CEO salary & bonus from 1980 to 1994 and a 209% increase in average CEO total compensation over this same period; also see Hall, 2002, for additional evidence). This period of increase corresponds with the period of increased vigilance in governance documented by Huson et al. (2001), among others (recall the discussion in Section 4 above). A possible response from executives to more vigilant governance has been to demand and receive greater compensation; that is, to be compensated for the disutility they suffer as a consequence of this more vigilant governance.

As a final note on this extension, the discussion has been framed in terms of CEO effort. "Effort," however, can be understood to refer not only to positive actions (*e.g.,* more time in the office, carrying out necessary, but unpleasant, tasks like firing subordinates, etc.) but also to refraining from pursuing actions that are beneficial to the CEO but harmful to the company (*e.g.,* consumption of certain perquisites, empire building, etc.); that is, one can interpret e as negative perquisite taking.

6 An Extension: CEO Compensation

As Proposition 6 established, the model analyzed above can be extended to yield predictions about CEO compensation. In this section, I explore an alternative extension that also potentially sheds some light on trends in executive compensation.

For convenience, I return to the version of the model with*out* CEO effort. Assume, initially, that there are many CEO candidates and only a few firms, so that the firms have the bargaining power in negotiating employment contracts. In addition, assume initially that all candidates have the same estimated ability, μ, which is estimated with the same precision, τ.

Assume that a candidate for CEO will accept employment only if his expected utility exceeds some reservation level $\underline{U}$. As in the previous section, assume that a CEO enjoys some benefit $b > 0$ if he survives to the last stage (stage 4). If he is dismissed prior to that stage, he receives no benefit. Let w be the wage he is paid. Then he accepts employment only if

$$w + b\big(P^*\Phi + (1 - P^*)\big) \geq \underline{U}\,. \tag{12}$$

Because the firms have all the bargaining power, (12) is binding; that is, a CEO's wage is given by

$$w = \underline{U} - b\big(P^*\Phi + (1 - P^*)\big)\,. \tag{13}$$

Differentiating that expression with respect to δ, the measure of the board's diligence, yields

$$\frac{\partial w}{\partial \delta} = -b\frac{\partial P^*}{\partial \delta}(\Phi - 1) > 0 \tag{14}$$

($\partial P^*/\partial\delta > 0$ by Proposition 1). This yields:

Proposition 7 *If the market for* CEO*s is homogenous, then*

(i) firms with more diligent boards will pay their CEO*s more than firms with less diligent boards; and*

(ii) as diligence increases over time across firms, average CEO *compensation will also increase.*

The cross-sectional prediction, result (i) of Proposition 7, might seem at odds with a sense, common in the popular press at least, that it is *weak* boards that overpay their CEOs.[25] Such intuition is clearly mistaken when CEO talent is homogenous in the relevant market. Such intuition can, however, be redeemed—at least in part—if we depart from the assumption of homogeneity: Suppose, now, that there are a few "superstar" CEOs in the market with estimated ability μ_1. Let the rest of the market consist of "run-of-the-mill" CEOs, with estimated ability $\mu_0 < \mu_1$. Assume, however, that the estimated abilities of both sets of CEO candidates are estimated with the same precision (*i.e.,* τ is common across all candidates). Beyond the differences in their estimated abilities, type-0 and type-1 CEO candidates differ in terms of their market power: The former have no market power and command a wage given by (13); while the latter have complete market power, which means they can capture all the surplus a board

[25] See Bebchuk and Fried (2003) for a more scholarly argument for this view.

could gain by employing a type-1 CEO rather than a 0-type. Hence, the wage of a 1-type is determined by

$$\begin{aligned}\delta\big(P_1^*V_1 + (1-P_1^*)\mu_1 - w_1\big) - c(P_1^*) &= \delta\big(P_0^*V_0 + (1-P_0^*)\mu_0 - w_0\big) - c(P_0^*)\\ &= \delta\left(P_0^*V_0 + (1-P_0^*)\mu_0 - \underline{U} + b\big(P_0^*\Phi_0 + (1-P_0^*)\big)\right) - c(P_0^*)\,, \qquad (15)\end{aligned}$$

where subscripts 0 and 1 denote whether the variable pertains to a 0-type or 1-type CEO candidate. Differentiating (15) with respect to δ, utilizing the envelope theorem, and using (15) to simplify yields

$$\frac{\partial w_1}{\partial \delta} = \frac{1}{\delta^2}\underbrace{\big(c(P_1^*) - c(P_0^*)\big)}_{\text{negative by Prop. 1}} - \delta\,\underbrace{b(\Phi_0 - 1)\frac{\partial P_0^*}{\partial \delta}}_{\text{negative by (14)}}\,. \qquad (16)$$

As (16) makes clear, the wage of a superstar CEO (*i.e.,* type 1) varies in an *in*determinant way with the diligence of the board. On the one hand, board diligence is a substitute for managerial ability (this is what, after substitution, the difference in the $c(\cdot)$s represents in (16)). Hence, the marginal value of a superstar CEO over a run-of-the-mill CEO is less, the more vigilant the board is. On the other hand, a more diligent board is already a high-paying board, hence the incremental cost of a superstar is less than for a less diligent board (this is what the second term of (16) represents). Hence, the marginal cost of a superstar CEO over a run-of-the-mill CEO is less, the more diligent the board is. On net, there is no reason to expect one of the two marginal effects to be dominant and, in fact, one can find examples in which either one is dominant.[26]

In those cases in which (16) is negative, the following situation exists. Let $\bar{w}_\kappa$ denote the wage of a type-κ CEO dealing with a more diligent board and let $\underline{w}_\kappa$ denote the wage of a type-κ CEO dealing with a less diligent board (assume, for convenience, two levels of diligence). Then $\underline{w}_1 > \bar{w}_1 > \bar{w}_0$. That is, the highest wages in cross-section will be paid by the less diligent board. Depending on the relative frequency of the two kinds of boards relative to the two types of CEO candidates, it is also possible that the less diligent boards pay more on average than do the more diligent boards.

Indeed, the same conclusion about the cross-section can still be reached even if $\bar{w}_1 > \underline{w}_1 > \bar{w}_0$: Because a firm with a more diligent board is a less attractive workplace for a CEO, it is possible that, even if the more diligent board is willing to pay more for a superstar CEO, the superstar's expected utility is higher at a firm with a less diligent board. So, again, the highest wages in cross-section are paid by the less diligent board. Hence, again, it is possible that average CEO compensation is higher at firms with less diligent boards.

While cross-sectionally, one can, thus, find an inverse relation between board diligence and CEO compensation, it is still likely that the time series effect of a secular trend toward greater board diligence is to lead to an increase in CEO

[26] For example, let $c(p) = p^2/2$, $\tau = 1$, $s = 1$, $\mu_1 = 1$, $\mu_0 = 1/2$. Then (16) is negative if $b = 1$, but positive if $b = 2$, when evaluated at $\delta = 1/2$.

compensation: As boards become more diligent, the compensation of the run-of-the-mill (type-0) CEOs increases because they require compensation for the greater disutility they suffer from working for more diligent boards. Because the run-of-the-mill CEOs are the majority, the consequence for average CEO compensation across all firms is that it increases as board diligence increases on average across firms. To summarize this discussion:

Observation 1 *With heterogenous* CEO*s, the following scenario is feasible within the model developed in this paper. In a cross-section of firms, at any moment in time,* CEO *compensation can vary inversely with the diligence of the board (measured, e.g., by the proportion of outsiders on the board). However, over time, as boards on average become more diligent, the trend should be toward an increase in* CEO *compensation; that is, across time,* CEO *compensation should co-vary positively with the diligence of the board.*

7 Final Thoughts

This paper has set forth a plausible model of board behavior—specifically that, to varying degrees, boards seek to determine whether they should keep the CEO they have or replace him, where replacement is a costly option—and shown how it can tie together a number of trends in corporate governance. In particular, if there is a secular trend toward more vigilant governance, then the model predicts the following trends should also be observed: (i) the frequency with which external candidates are the winning candidates to become CEO should increase; (ii) the average tenure of CEOs should fall; (iii) CEO effort should increase; and (iv) average CEO compensation should increase. The model also offers an insight (v) into how board vigilance and CEO compensation can co-vary inversely in cross-sectional data, but co-vary positively in time-series data. Finally, if one is willing to assume the underlying distributions of estimated abilities for internal and external candidates are not too dissimilar or the distribution of the external candidates is degenerate, then the model predicts that (vi) external candidates appointed CEO will have shorter tenures on average than internal candidates who are appointed CEO.

While the model is quite successful in tying together various trends in corporate governance, there is more work that can be done. Some of it is primarily technical, such as working out the mixed-strategy equilibrium that can exist in the effort model (Section 5). Other remaining work is more substantive. For instance, the CEO labor market has largely been ignored or, as in Section 6, modeled in a highly stylized manner. A richer model of this market should offer more definitive insights into patterns to be expected in the cross-sectional data.

A related issue is CEO compensation. Although the analysis presented here addresses issues connected with total compensation—particularly why its overall expected value should increase—the paper says little about the components of compensation. As boards become more diligent, should we expect the use of incentive pay to increase or decrease? Can the trend in greater board diligence

be tied to the apparent trend towards greater use of stock options in executive compensation?

Another issue is to tie this model into the CEO-life-cycle model of Hermalin and Weisbach (1998). In their model, over a CEO's tenure in office, more is learned about him. Because only able CEOs are retained, this means that CEOs with long tenures will generally have proved themselves to be considerably better than the expected value of replacements. This makes them "rare commodities," which in turn gives them bargaining power against the board. One objective they will bargain for is greater pay, but another is less scrutiny. Less scrutiny can be achieved only by getting a less diligent board. (Note this model, thus, offers another explanation for an inverse relation between CEO compensation and board diligence in cross-sectional data—high-paying firms are those with a proven CEO, who is thus able to bargain for high pay and a less diligent board.) The mechanics of the Hermalin and Weisbach (1998) model are such that there is a trend *during* a CEO's tenure toward *less* board diligence (a prediction—if proportion of outsiders is a proxy for board diligence—borne out in the data, see Hermalin and Weisbach, 1988). A question not fully addressed by either Hermalin and Weisbach (1998) or this paper is how an overall trend to increased board diligence can be reconciled with this tendency, within any given firm over the CEO life-cycle, towards less diligence? What are the mechanics by which boards become more diligent?

Despite these open issues, the analysis presented here demonstrates that starting from a simple model of board monitoring, one can tie together a number of trends in corporate governance. Moreover, this analysis provides a framework whereby one can consider the consequences of various reforms; for instance, that pressure to have boards that are tougher and more independent of management can have the, perhaps undesirable, feature of leading to greater executive compensation.

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Appendix: Proofs

Proof of Proposition 1: Some preliminaries. First, recall that $\phi'(z) =$

$-z\phi(z)$. Second, observe that

$$\begin{aligned}\frac{\partial V}{\partial Y} &= -\mu\phi\big(-(Y-\mu)\sqrt{H}\big)\sqrt{H} - \frac{H}{\tau}\phi\big((Y-\mu)\sqrt{H}\big)[Y-\mu]\sqrt{H}\\ &= \phi\big((Y-\mu)\sqrt{H}\big)\sqrt{H}\left(-\mu + \frac{s}{s+\tau}\left[\frac{\tau\mu}{s}+\mu\right]\right)\\ &= 0\,. \end{aligned} \tag{17}$$

Third, observe that (using expression (17) to eliminate $\partial V/\partial Y \times \partial Y/\partial\mu$ terms):

$$\begin{aligned}\frac{\partial V}{\partial \mu} &= \Phi + \mu\phi\sqrt{H} + \frac{H\sqrt{H}}{\tau}(Y-\mu)\phi\\ &= \Phi + \phi\sqrt{H}\left(\mu - \frac{s}{s+\tau}\left[\frac{\tau\mu}{s}+\mu\right]\right)\\ &= \Phi\,. \end{aligned} \tag{18}$$

Turning to claims (i)–(iii): Let Ω be the objective function in expression (5). Consider claim (i):

$$\begin{aligned}\frac{\partial^2\Omega}{\partial\mu\partial p} &= \frac{\partial[V-\mu]}{\partial\mu}\\ &= \Phi - 1 \qquad \text{(from expression (18))}\\ &< 0\,, \end{aligned}$$

so, by the usual comparative statics, $\partial P^*/\partial\mu < 0$. Similarly,

$$\begin{aligned}\frac{\partial^2\Omega}{\partial\delta\partial p} &= V-\mu > 0\,;\text{ and}\\ \frac{\partial^2\Omega}{\partial\tau\partial p} &= \frac{\partial V}{\partial\tau}\\ &= \left(-1+\frac{1}{2}\frac{s}{s+\tau}\right)\frac{\sqrt{H}}{\tau^2}\phi < 0 \end{aligned} \tag{19}$$

(where (19) relies on (17)). Hence, $\partial P^*/\partial\delta > 0$ and $\partial P^*/\partial\tau < 0$. ■

Proof of Proposition 2: Define

$$\begin{aligned}W_E &= \delta\left(P_E^* V_E + (1-P_E^*)\mu_E\right) - c(P_E^*) \text{ and}\\ W_I &= \delta\left(P_I^* V_I + (1-P_I^*)\mu_I\right) - c(P_I^*)\,. \end{aligned}$$

W_E (alt. W_I) is the board's expected value from hiring an external (alt. internal) candidate. Observe that W_I can be written as

$$\begin{aligned}W_I(\Delta) =& \delta P_I^*\left[(\mu_E+\Delta)\Phi\left(-(Y_I-[\mu_E+\Delta])\sqrt{H_I}\right) + \frac{\sqrt{H_I}}{\tau_I}\phi\left((Y_I-[\mu_E+\Delta])\sqrt{H_I}\right)\right]\\ &+ \delta(1-P_I^*)(\mu_E+\Delta) - c(P_I^*)\,. \end{aligned}$$

Next, differentiate $W_I(\Delta)$, recalling, from the proof of Proposition 1, that $\partial V/\partial Y = 0$ (expression (17)) and $\partial V/\partial \mu = \Phi$ (expression (18)) and utilizing the envelope theorem:

$$W_I'(\Delta) = \delta\left(P_I^*\Phi + (1-P_I^*)\right) > 0\,. \tag{20}$$

If it can be shown both that $W_I(0) < W_E$ and there is a Δ such that $W_I(\Delta) > W_E$, then the existence of a Δ_m with the properties stated in the proposition follows from (20). To see that $W_I(0) < W_E$, observe that

$$\begin{aligned}\frac{\partial W}{\partial \tau} &= \delta P^* \frac{\partial V}{\partial \tau} \qquad (21)\\ &= \delta P^* \left(-1 + \frac{1}{2}\frac{s}{s+\tau}\right)\frac{\sqrt{H}}{\tau^2}\phi < 0\,,\end{aligned}$$

where (21) follows from the envelope theorem. Hence,

$$W_I(0) < W_E\,, \tag{22}$$

because $\tau_I > \tau_E$. To show that there is a Δ such that $W_I(\Delta) > W_E$, observe that

$$W_I(\Delta) \geq \delta(\mu_E + \Delta) - c(0)\,.$$

Hence,

$$\lim_{\Delta\uparrow\infty} W_I(\Delta) = \infty\,. \tag{23}$$

This establishes the first part of the proposition.

To show the "moreover" part, start from the identity:

$$0 \equiv W_I(\Delta_m) - W_E\,. \tag{24}$$

Differentiate this with respect to δ, utilizing the envelope theorem:

$$\begin{aligned}0 &= \frac{\partial(W_I(\Delta_m) - W_E)}{\partial\delta}\\ &= \underbrace{\delta\big(P_I^*\Phi + (1-P_I^*)\big)}_{W_I'(\Delta_m)}\frac{\partial\Delta_m}{\partial\delta} + \big(P_I^*V_I + (1-P_I^*)\mu_I\big)\\ &\qquad\qquad - \big(P_E^*V_E + (1-P_E^*)\mu_E\big)\\ &= \delta\big(P_I^*\Phi + (1-P_I^*)\big)\frac{\partial\Delta_m}{\partial\delta} + \frac{1}{\delta}\left(c(P_I^*) - c(P_E^*)\right)\,, \qquad (25)\end{aligned}$$

where $W_I'(\Delta_m)$ comes from (20) and the third equality follows because (24) can rewritten as

$$\delta\left(P_I^*V_I + (1-P_I^*)\mu_I\right) - \delta\left(P_E^*V_E + (1-P_E^*)\mu_E\right) = c(P_I^*) - c(P_E^*)\,.$$

Because $\Delta_m > 0$, $\mu_I > \mu_E$. By assumption, $\tau_I > \tau_E$. Results (i) and (ii) of Proposition 1 therefore imply that $P_E^* > P_I^*$; hence

$$c(P_I^*) - c(P_E^*) < 0\,.$$

But, then, (25) holds if and only if $\partial\Delta_m/\partial\delta > 0$, which establishes the "moreover" part. ■

Proof of Proposition 3: By assumption, $\tau_I > \tau_E$. From Corollary 1, for the board to be indifferent, it must be that $\mu_I > \mu_E$. Hence, result (i) of this proposition follows immediately from results (i) and (ii) of Proposition 1. To show result (ii) of this proposition it is sufficient to show that

$$-(Y-\mu)\sqrt{H} = \frac{s+\tau}{s}\mu\sqrt{H} = \frac{\tau}{\sqrt{H}}\mu$$

is increasing in both μ and τ. Clearly that expression is increasing in μ. Differentiating that expression with respect to τ yields:

$$\begin{aligned}\frac{\partial}{\partial\tau}\frac{\tau}{\sqrt{H}}\mu &= \frac{\sqrt{H} - \frac{1}{2}\tau\frac{1}{\sqrt{H}}\frac{s^2}{(s+\tau)^2}}{H}\mu \\ &= \frac{\sqrt{H} - \frac{1}{2}\frac{1}{\tau\sqrt{H}}H^2}{H}\mu\,,\end{aligned}$$

which has the same sign as

$$1 - \frac{1}{2}\frac{H}{\tau} = 1 - \frac{1}{2}\frac{s}{s+\tau} > 0\,.$$

Hence, the probability of *retaining* a position as CEO is increasing in both μ and τ, which means the probability of *dismissal* is greater for an external candidate than an internal candidate. Result (iii) of this proposition follows immediately from results (i) and (ii) of this proposition. ■

Proof of Corollary 2: From Proposition 2, any internal candidate who is hired must have an estimated ability greater than μ_E. That is, in the population of *hired* CEOs, $\mu_I > \mu_E$. The proof of Proposition 3 is readily seen as being valid for any μ_I and μ_E pair such that $\mu_I > \mu_E$. The corollary follows as it is just a restatement of result (iii) from Proposition 3. ■

Proof of Proposition 4: Result (i) follows immediately from the second half of Proposition 2. To show result (ii), observe the probability of dismissal conditional on employment is

$$\Pr\{\text{dismissal}\} = P^*\Phi\big((Y-\mu)\sqrt{H}\big)\,.$$

Hence,

$$\begin{aligned}\frac{\partial\Pr\{\text{dismissal}\}}{\partial\delta} &= \frac{\partial P^*}{\partial\delta}\Phi\big((Y-\mu)\sqrt{H}\big) \\ &> 0\,,\end{aligned}$$

where the second line follows from result (iii) of Proposition 1. Hence, result (ii) follows provided the change in δ doesn't change the choice of candidate (internal

vs. external). If the change in δ does change the choice of candidate, then, from Proposition 2, an increase in δ causes a "switch" from the internal to the external candidate. By Corollary 1, if the internal candidate is hirable under any circumstances, $\mu_I > \mu_E$. Consequently, this external candidate would receive more scrutiny *ceteris paribus* than the internal candidate by results (i) and (ii) of Proposition 1. Because an increase in δ also increases the level of scrutiny (result (iii) of Proposition 1), the overall effect of an increase in the board's δ is to increase the probability that any CEO it employs gets fired. ■

Proof of Proposition 5: From (10), equilibrium effort is greater the greater is

$$bP^*\phi\big(-(Y-\mu)\sqrt{H}\,\big)\sqrt{H} = bP^*\phi\left(\frac{\tau}{\sqrt{H}}\mu\right)\sqrt{H}\,. \tag{26}$$

Because $\mu > 0$, a small decrease in μ pulls the argument of ϕ from the right tail of the normal distribution toward its mode, which, thus, means ϕ is increasing as μ decreases. From Proposition 1, P^* also increases as μ falls. Hence (26) increases as μ falls, which establishes result (i).

The only term in (26) that depends on δ is P^*, which is increasing in δ (recall Proposition 1). This establishes result (ii). ■

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