Active Institutional Shareholders and Costs of Monitoring: Evidence from Executive Compensation

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Abstract

Although evidence suggests that institutional investors play a role in monitoring management, not all institutions are equally willing or able to serve this function. We present a stylized model that examines the effects of institutional monitoring on executive compensation. The model predicts that institutions' influence on managers' pay-for-performance sensitivity and level of compensation is reduced when institutions have greater implied costs of monitoring, but that these effects are attenuated when the firm-specific cost of monitoring is high. Our empirical results are broadly consistent with these implications, consistent with the notion that independent investment advisors and investment managers have advantages in monitoring firms' management.

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1. Introduction

Monitoring by institutional investors is an important governance mechanism for corporate management. Theory suggests, and empirical evidence confirms, that some institutional investors can provide active monitoring that is difficult for smaller, more passive or less-informed investors.[1] For example, the forced ouster of the New York Stock Exchange CEO, Richard Grasso, over perceived excesses in his compensation package was fueled to a large extent by the vocal outrage of some institutional investors (Wall Street Journal, September 17, 2003). The intensity of institutions' monitoring can be limited, however, by concerns about the liquidity of their portfolios (e.g., Bhide, 1994), fiduciary duties (e.g., Murphy and Van Nuys, 1994), potential business relations with the firm (e.g., Brickley, Lease and Smith, 1988), or the free-rider problem that appears due to the private cost of monitoring (e.g., Shleifer and Vishny, 1986).

In this paper, we examine the relation between institutional monitoring and executive compensation. Examining this relation is interesting for a number of reasons. First, it considers the interrelation between two central governance mechanisms that have gained importance in the last decade (e.g., Holmstrom and Kaplan, 2001). Second, although monitoring by institutional investors may affect many firms' decisions, much of its influence is not observable (e.g., projects not taken) and hence hard to test. In contrast, the fact that compensation is observable allows for empirical testing of our model of institutional monitoring and its effects. Third, examining the relation can help develop a better understanding of the nature of the agency problem between

[1] Examples include Black (1992), Kaplan and Minton (1994), Kahn and Winton (1998), Del Guercio and Hawkins (1998), Gillan and Starks (2000), Noe (2002), and Almazan and Suarez (2003).

shareholders and managers.[2] Finally, examining whether the presence of different types of institutions leads to observable differences in compensation can shed light on heterogeneity in monitoring costs across institutional investors, which in turn has important implications for the debate over the proper degree of institutional involvement in corporate governance.

Formally, we develop a stylized model of a firm owned by three classes of shareholders with different monitoring technologies. The first two classes are potential monitoring shareholders (institutions) who can assess managerial performance at a cost, but where the costs differ between the classes. The third class consists of other shareholders (individuals) who cannot monitor (i.e., for whom monitoring costs are prohibitive). As a result, the combination of differences in both the composition of the shareholder base across these three classes of shareholders and their incentives affects managerial compensation. Specifically, the model implies that the *pay-for-performance sensitivity* of managerial compensation is increasing in the ownership of monitoring shareholders and decreasing in their costs of monitoring. It also implies that the *level* of executive compensation is decreasing in the ownership of the monitoring shareholders and increasing in their costs of monitoring.

Our model predicts a complementary relation between monitoring by institutions and the degree of pay for performance in the compensation structure. This prediction stems from the fact that we model institutional monitoring as a mechanism that reduces the rents that managers can extract from corporations, i.e., institutions are monitors of compensation rather than of managerial effort or project selection. This approach contrasts with the simple principal-agent paradigm, where compensation and institutional monitoring substitute for each other as a means to provide managerial incentives.[3]

[2] As we discuss below, the literature has debated whether pay arrangements can be seen as part of the solution to the agency problem or as part of the agency problem itself. See Hall and Murphy (2003) and Bebchuk and Fried (2003, 2004) for views on these issues.

[3] This role for institutions appears consistent with much of practice, where institutions have largely been focused on improving firms' governance rather than dictating corporate strategy

To test the empirical predictions of our model, we consider differences in costs across institutional investors. A convenient differentiator is to consider the major types of institutional investors: bank trust departments, insurance companies, independent investment advisers, and insurance companies. These institutions differ across their legal, regulatory, and competitive environments as well as across their investment strategies (e.g., Badrinath, Kale and Ryan, 1989, Del Guercio, 1996, Falkenstein, 1996, and Bennett, Sias and Starks, 2003). As such, we would expect the costs of monitoring to differ as well. For example, institutions may differ in the skill of their employees, their resources or incentives to gather information, the implicit or explicit pressure from firms in which they invest due to potential business relations (Brickley, Lease and Smith, 1988), or the restrictiveness of their regulatory and legal environments.

Based on these differences in costs, we divide our institutional investor types into two groups: potentially active institutional investors and potentially passive institutional investors.[4] The first group (potentially active investors) includes the types of institutions we expect have more skilled employees, are more likely to collect information, face less regulatory and legal restrictions on their investments, and have less natural potential for business relations with the corporations: investment advisers and investment companies. The second group (potentially passive investors) consists of the bank trust departments and insurance companies. The institutions within each of the two groups are more similar in these dimensions than are institutions across the groups.[5] As such, we expect the costs of monitoring to differ across groups as well, with the potentially

(e.g., see TIAA-CREF's policy statement on corporate governance, http://www.tiaa-cref.org/libra/governance/index.html).

[4] Throughout the paper for simplicity we often use the terms, "active" and "passive" to mean "potentially active" and "potentially passive," respectively. In addition, the term "active" implies institutional investors who monitor through voice rather than large active investors who take over the firm as the term is used, for example, by Bethel, Liebeskind, and Opler (1998) or Denis and Serrano (1996).

[5] For differences in compensations across the two groups, see, for example, Williamson (2000).

active group having lower costs.[6] Our empirical tests then are jointly testing the predictions of the model, and that investment advisors and investment companies have lower costs of monitoring than do bank trust departments and insurance companies.

Our empirical design also allows for the presence of firm-specific costs of monitoring. Specifically, the monitoring of both active and passive investors should be affected by firm-specific costs of gathering information about the firm. We measure these firm-specific costs by considering the firms' stock price liquidity, which can proxy for the information available for a firm (e.g., Holmstrom and Tirole, 1993). Finally, since the potential benefits from monitoring increase with the monitoring investor's ownership in the firm, our primary explanatory variables are the respective concentrations of ownership for our two classes of institutional investors (active and passive).

Our empirical results broadly support the model's predictions. We find that, in general, the pay-for-performance sensitivity of managerial compensation is increasing in the concentration of active institutions' ownership, but is not significantly related to the concentration of passive institutions' ownership. This result is consistent with active institutions (investment advisors and investment companies) facing lower costs of monitoring than passive institutions (banks and insurance companies). Further, consistent with institutional ownership driving pay practices, we find that increases in the concentration of either type of institutional ownership are followed by increases in pay-for-performance sensitivity. We also find that the level of executive compensation is decreasing in the concentration of both types of institutional investors' ownership. Finally, we find that the institutions' monitoring is attenuated when the firm's stock price is less liquid, which we interpret as an indication of an important firm-specific cost of monitoring.

[6] Our divisions into potentially active and passive institutional investors are consistent with the Brickley, Lease and Smith (1988) divisions into pressure-insensitive and pressure-sensitive institutional investors.

These findings complement the Brickley, Lease and Smith (1988) evidence regarding differences in proxy voting across types of institutions, as well as evidence by Hartzell and Starks (2003) that documents systematic influences of institutional investors on managerial compensation. The latter paper, however, does not examine whether the intensity of monitoring differs across different types of institutions, nor does it examine what factors can explain differences in institutional monitoring across firms. Our findings are also related to the results of Parrino, Sias and Starks (2003), who find a relation between CEO turnover and institutional selling (particularly by banks and independent investment advisers) and Pinkowitz (2003), who finds a relation between the success of hostile takeovers and mutual-fund selling.[7]

The rest of the paper is organized as follows. The next section describes and analyzes the model. Section 3 presents the data and Section 4 our empirical findings. We conclude the paper in Section 5.

2. Managerial compensation and monitoring shareholders

In this section, we develop a model of managerial compensation in the presence of monitoring shareholders. We then discuss the empirical implications of the model.

A. Model

We consider an all-equity publicly-traded firm that operates in a risk-neutral economy in which the risk-free rate is normalized to zero. The firm is owned by three classes of shareholders who differ in their abilities to monitor management: (i) active institutional investors, (ii) passive institutional investors and (iii) other investors, (i.e.,

[7] David, Kochar and Levitas (1998), Clay (2001), and Hartzell and Starks (2003) find clientele relations between executive compensation and institutional ownership, that is, evidence of greater total institutional ownership in companies with more pay-for-performance sensitivity and lower excess compensation, consistent with institutions preferring to invest in those firms. Further David, Kochar, and Levitas show that for the largest 200 corporations, institutions with less potential for a business relation with the corporations have stronger clientele effects.

individuals). We denote the proportions of the firm owned by active and passive institutional investors as α_a and α_p, respectively. The remainder of the firm, i.e., $(1-\alpha_a-\alpha_p)$, is owned by other (non-institutional) investors.

We consider a three-period setting with symmetric information between managers and shareholders. At t=0, the shareholders hire a manager (i.e., the incumbent) to run the firm.[8] Managers have no wealth, are protected by limited liability, and have a zero reservation level of utility. When the manager is hired, neither the shareholders nor the manager knows the manager's skill level, but they agree that, with equal probability, it can be either *H* (a high-skill manager) or *L* (a low-skill manager).

At t=1, the incumbent's skill is revealed, which in turn determines the future performance of the firm under his or her management. For simplicity, we denote the firm's cash flow under a high- or low-skill manager as *H* or *L*, respectively. Knowing his or her skill level, the incumbent manager makes a salary demand, w^S, $s=\{H,L\}$ for the next period. At this point, if an institutional investor i, $i=\{a,p\}$, incurs a monitoring cost c_i, then, with probability δ_i, the institution finds a manager of "medium" skill *M* and replaces the incumbent. (Without loss of generality, we normalize the salary of the replacement manager to zero.) Alternatively, with probability $(1-\delta_i)$, the institutional investor finds no managerial replacement, and as a result, the demanded salary (w^S) is accepted and the incumbent remains in charge.[9] Institutions differ in their monitoring technologies: Active institutions' technology is more efficient than the technology employed by passive institutions, i.e., the active institutions face a lower ratio of costs to benefits, implying $c_a/\delta_a < c_p/\delta_p$. In contrast, the third class of shareholders, i.e., non-institutional investors, cannot monitor and have no influence on the firm's governance.

[8] We abstract from a board of directors and assume that the shareholders as a group directly hire a manager to run the firm. Similar results would be obtained by considering a board of directors that can be influenced by institutional investors.

[9] As we show, the ability to identify the talent of potential replacements can be essential to limit managerial power in the firm. Implicitly, we are assuming that without such a technology, substituting an unqualified replacement for existing managers is impossible or would produce a great loss to the firm.

Finally, at t=2, the firm produces the liquidating cash flow (*H*, *M* or *L*), which depends on the ability of the manager in charge. Since the central goal of our analysis is to examine how shareholders' monitoring incentives affect managerial compensation, we abstract from trading considerations and assume that all investors buy into the firm at time 0, and maintain their investment until the firm is liquidated at time 2.

We consider two fundamental, interrelated elements in the conflict between managers and shareholders: (i) the existence of substantial managerial control rents and (ii) the presence of managerial entrenchment. We focus on the importance of managerial control rents by assuming that monetary rewards play a secondary role for managers. Specifically, we assume that managers' primary goal is control of the corporation. After retaining control, their secondary goal is to maximize their monetary rewards. We model managerial entrenchment by assuming that when managers are in charge of the corporation at t=1, they propose their own level of monetary compensation up to a limit $K \leq L$.[10]

To decide whether or not to look for a managerial replacement, in addition to considering the incumbent manager's revealed skill and proposed compensation, each institutional investor weighs the cost of monitoring and the likelihood of finding a replacement, as well as the probability of intervention and successful monitoring by the other institutional investor. To simplify the analysis, we assume that only one replacement attempt is possible and that this attempt is made by the institutional investor whose expected gain from replacing the manager is the largest.[11]

We analyze the model under the following parametric restrictions:

$$H > M + K - c/(\alpha\delta) > L > M + (1-\delta)K - c/(\alpha\delta), \qquad (1)$$

[10] We discuss the factors that can affect *K* later in this section.
[11] This is for simplicity. Alternative formulations in which multiple replacement attempts are possible or in which monitoring efforts by institutions are complementary produce similar results.

where, $c/(\alpha\delta) \equiv \min \{ c_a/(\alpha_a\delta_a), c_p/(\alpha_p\delta_p)\}$ and δ is the probability of finding a replacement for the investor for which $c_i/(\alpha_i\delta_i)$ is the lowest. We provide intuition for these restrictions in the discussion of Proposition 1 below.

To solve the model, we need to determine the manager's compensation and how this compensation is related to the firm's ownership structure. Because managers anticipate the threat of institutional-investor driven managerial replacements, the amount of compensation that the incumbent achieves (depending on the managerial skill) is a function of institutional ownership. Proposition 1 formally describes these results:

Proposition 1: In the presence of active and passive institutional investors with ownership (α_a, α_p) and monitoring technologies $[(c_a, \delta_a),(c_p, \delta_p)]$, respectively, a high-skill manager (who generates cash-flow H) obtains a salary, $w^H = K$, while a low-skill manager obtains a salary, $w^L = c/(\alpha\delta) - (M - L)$.

Proposition 1 follows from comparing the constraints faced by a manager when proposing compensation at t=1: the salary limit, K, and the fact that if the salary demand is excessive, institutional investors will attempt to replace the incumbent. Formally, after a signal $s=\{H,L\}$, the manager's salary demand w^S solves:

$$Max\ w^S$$

subject to:

$$w^S \leq K \qquad (2)$$

$$\alpha_a (s - w^S) \geq \delta_a\alpha_a M + (1-\delta_a)\alpha_a(s - w^S) - c_a. \qquad (3)$$

$$\alpha_p (s - w^S) \geq \delta_p\alpha_p M + (1-\delta_p)\alpha_p(s - w^S) - c_p. \qquad (4)$$

Constraint (2) is the manager's salary limit, which by (1) is binding only when the manager has high skill ($s=H$). Constraints (3) and (4) follow from the active and passive institutions' decisions regarding whether to attempt to replace a manager. Since they

will not want to make a replacement when the incumbent's skill is revealed to be high, these constraints come into play with a low-skill signal ($s=L$). Specifically, (3) binds when $c_a/(\alpha_a\delta_a) < c_p/(\alpha_p\delta_p)$, that is, when the signal is low and the cost/benefit tradeoff for manager replacement is higher for the passive institution than for the active institution, in which case, the active institution incurs the monitoring cost. However, if the cost/benefit tradeoff inequality is reversed, then (4) binds and the passive institution monitors. (In the case of equality, constraints (3) and (4) are identical.)

Assumption (1) plays a fundamental role in the results obtained in Proposition 1. Specifically, the three inequalities considered in assumption (1) guarantee that: (i) a high-skill manager *can* demand the maximum salary K without inducing shareholder monitoring, $H > M + K - c/(\alpha\delta)$, (ii) a low-skill manager *cannot* demand the maximum salary K without inducing shareholder monitoring, $L < M + K - c/(\alpha\delta)$, and (iii) a low-skill manager wants to discourage shareholder monitoring, $L > M + (1-\delta)K - c/(\alpha\delta)$.

Since by definition, active institutions have a technological advantage in monitoring ($c_a/\delta_a < c_p/\delta_p$), this implies that when the institutions have similar levels of ownership, the active monitors play the monitoring role in the corporation. Large differences in ownerships, however, can offset this advantage and induce the passive institutions to play a larger monitoring role on the margin (i.e., $c_a/(\alpha_a\delta_a) > c_p/(\alpha_p\delta_p)$). As discussed above, the fact that only one institution is active in monitoring is an artifact of the simple model that we consider. The important message is that, in practice, the intensity of monitoring by institutions should be positively related to the efficiency of their monitoring technologies.

These available technologies (i.e., whether constraint (3) or constraint (4) is binding) also play a role in Propositions 2 and 3 below, which describe the structure of compensation. In both propositions, the comparison between the ratios $c_a/(\alpha_a\delta_a)$ and $c_p/(\alpha_p\delta_p)$ determines who the "marginal" monitor in a firm is.

If we define the pay-for-performance sensitivity (*PPS*) of the manager's compensation to be the difference in managerial compensation as a function of the firm's cash flow (i.e., the shareholders' wealth before managerial compensation), then

$$PPS \equiv w^H - w^L = K - [c/(\alpha\delta) - (M - L)] = K + (M - L) - c/(\alpha\delta), \quad (5)$$

where $c/(\alpha\delta) \equiv \min \{ c_a/(\alpha_a\delta_a), c_p/(\alpha_p\delta_p)\}$. This implies Proposition 2:

Proposition 2. (Pay-for-performance sensitivity) The pay-for-performance sensitivity of the manager's compensation is (i) non-decreasing in the total of the monitoring shareholder's ownership in the firm $(dPPS/d\alpha_i \geq 0)$, and (ii) non-increasing in the ratio of that institutions' cost of monitoring to its probability of success $(dPPS/d(c_i/\delta_i) \leq 0)$. Furthermore, conditional on being the marginal monitor, the effects on compensation are more intense for active than for passive institutions (i.e., $|dPPS/d\alpha_a| > |dPPS/d\alpha_p|$ and $|dW/d\alpha_a| > |dW/d\alpha_p|$).

The expected (or average) level of compensation, *W*, is defined as

$$W \equiv \tfrac{1}{2}(w^H + w^L) = \tfrac{1}{2}[K + c/(\alpha\delta) - (M - L)]. \quad (6)$$

The main determinants of W are considered in the following proposition:

Proposition 3. (Level of compensation) The level of compensation (i) decreases (weakly) with the ownership of each class of institutional investor $(dW/d\alpha_i \leq 0)$, and (ii) increases (weakly) with the ratio of the cost of monitoring to its probability of success $(dW/d(c_i/\delta_i) \geq 0)$.

B. Discussion

In our model, the incumbent's ability to influence his or her own compensation is in the spirit of the "managerial power hypothesis" (e.g., Bertrand and Mullainathan, 1999, 2000; Bebchuk, Fried, and Walker, 2002; and Bebchuk and Fried, 2004), which

contends that entrenched managers can set their own compensation (i.e., extract rents) due to their ability to capture the board of directors.[12] If one views the CEO pay process as a continuum, the managerial power hypothesis lies at one extreme with the managers having almost complete power to set pay. At the other extreme lies the agency (or contracting) model in which the power to set pay is held by the shareholders who set pay to align the managers' incentives with their own. Although our model is related to the managerial power hypothesis, it also captures Murphy's (2002) view that managers bargaining power is indeed limited. In particular, we consider two limits to the managerial power. The first limit comes from the presence of monitoring institutional shareholders: If managers do not produce sufficient cash flows to justify their pay, they can be replaced (with some probability) or pressured to reduce their compensation. The second limit stems from the maximum compensation (i.e., K) that, even in the absence of shareholder pressure, a manager can obtain.

Although we do not explicitly model the determinants of K, one can argue that other factors related to governance (e.g., takeover pressure), internal firm organization (e.g., availability of CEO successors) and "outrage costs" are likely to play a role.[13] While we have simply assumed that K is fixed (i.e., it does not depend on the firm's value), similar results can be obtained if the compensation limit increases with firm value (e.g., $K_H > K_L$). In this case, the presence of institutions would increase the sensitivity of compensation from what would be $(K_H - K_L)$ in their absence to $(K_H - (M+L-c/(\alpha\delta))$.

[12] The argument that managers have the power to set their own compensation and consequently extract rents has been extensively debated. Garvey and Milbourn (2003) argue that the Bertrand and Mullainathan results (i.e., managers who are paid for luck) can be due to executives' fair compensation for bearing risk and that such results do not prove that managers have captured the compensation process. On the other hand, consistent with the rent extraction arguments of Bertand and Mullanaithan (1999,2000) and Bebchuk, Fried and Walker (2002), Bebchuk and Fried (2004), Campbell and Wasley (1999) and Core Holthausen, and Larcker (1999) provide evidence that managers sometimes design compensation plans at the expense of the shareholders.

[13] For example, some compensation arrangements could cause embarrassment to the board of directors, could hurt managerial reputations, or could simply cause outsiders to develop perceptions that managers are expropriating rents.

Hence, our results hold to the extent that institutional monitoring influences compensation more intensely when a low value (rather than a high value) is predicted for the firm, i.e., when $K_L > M+L-c/(\alpha\delta)$.

Propositions 2 and 3 yield results consistent with the previous theoretical work of Shleifer and Vishny (1986), Huddart (1993) and Maug (1998a), who argue that large shareholders can be important in the mitigation of agency problems.[14] In addition, these propositions yield testable hypotheses regarding the relation between managerial compensation and institutional monitoring. These hypotheses are centered around two model inputs: the amounts of the firm owned by the monitoring institutions, α_i, and their monitoring technologies, as measured by the ratio of the cost of monitoring to the probability of monitoring successfully, c_i/δ_i.

In building proxies for institutional monitoring and ownership (for the empirical implementation of our model), we encounter two limitations. The first limitation derives from our assumption that monitoring (at the margin) comes from a single institution rather than from multiple institutions. Because of this assumption, the analysis results in the marginal monitoring institution's proportional ownership as being the relevant independent variable for institutional monitoring. However, in the presence of multiple institutional owners, the aggregate proportional ownership does not reflect the incentives to monitor as each of the institutions may have a very small ownership interest in the firm, thus, leading to the free-rider problems pointed out by Shleifer and Vishny (1986). To address this limitation, we employ the concentration of the institutional investors' ownership as the relevant measure. More specifically, we separate institutions into the two groups and examine whether ownership concentration in each group affects

[14] Empirical evidence suggests that large blockholders have provided successful monitoring functions. See, for example, Agrawal and Mandelker (1990), Kaplan and Minton (1994), Kang and Shivdasani (1996) or Bethel, Liebeskind, and Opler (1998). Evidence on activist public pension funds has been more mixed. See, for example, Karpoff, Malatesta, and Walkling (1995), Carleton, Nelson and Weisbach (1998), Gillan and Starks (1998), or Del Guercio and Hawkins (1998).

managerial pay patterns. Although the concentration of institutional ownership does not completely eliminate the free rider problem, it does capture the ownership of those institutions that have greater incentives to monitor. This construction is also consistent with Black's (1992) contention that institutional investors have more influence when they have allies in the form of other institutional investors with large holdings.

The second limitation in deriving a proxy for institutional ownership arises to the extent that aggregate institutional ownership is the result of the institutions' preferences for firms with "better" executive compensation structures. Using the concentration of institutional ownership also helps ameliorate this potential endogeneity problem.[15]

We also derive a proxy for our second model input, namely the differences in monitoring technologies, which we allow to differ both across institutions and the firms in which they invest. In the context of the model, this separation corresponds to segmenting the monitoring technologies c_i/δ_i into a shareholder-specific determinant of the monitoring costs that arises due to differences in the institutions' monitoring abilities and costs, plus a component that differs due to firm-specific characteristics. To test for variation in the costs of monitoring across institutions, we use the respective ownerships of different types of institutions.

Measures of firm-specific monitoring costs should be inversely related to the amount of information generated about the firm and reflected in its stock price, an aspect that can be captured by the stock's liquidity. Indeed, Holmstrom and Tirole (1993) and Garvey and Swan (2002) argue that more liquid firms have greater information flow (e.g., due to more informative prices and greater analyst following).[16] In our context, the greater degree of information about a firm facilitates institutional monitoring and helps

[15] To further ensure that endogeneity between executive compensation and institutional ownership is not driving our results, we also perform tests that examine the relation between long-run changes in institutional ownership concentration and subsequent long-run changes in pay-for-performance sensitivity.

[16] Brennan and Subrahmanyam (1995) and Roulstone (2002) find that analyst following and liquidity are positively associated.

identify potential replacements. Consistent with these arguments, we employ a measure of the stock's liquidity – the inverse of its turnover – as a proxy for the ratio of the cost of monitoring to the probability of successfully finding a replacement. We take this cost into account in relation to the institutional investor ownership by interacting this proxy with the concentration of total institutional investor ownership.[17]

Although one could imagine alternative proxies for the cost and likelihood of successfully replacing a manager, the immediate alternatives appear somewhat problematic. For example, industry-level variables that proxy for the costs and benefits of CEO replacement (Parrino, 1997) may capture effects that are hard to distinguish from any other industry-specific effect. Variables that capture managerial entrenchment are also logical candidates, but such variables raise endogeneity concerns that can make it difficult to interpret results.

3. Data

Our initial sample consists of the 1,914 firms included on the Standard & Poor's ExecuComp database over the 1992 through 1997 time period. The database covers roughly 1,500 firms per year, including the 500 firms in the S&P 500 Index, the 400 firms in the S&P Midcap Index, and the 600 firms in the S&P Smallcap Index. For up to five top executives from each firm, we retrieve details of their compensation package, including salary, bonus, long-term incentive plan payouts, stock and option grants and other compensation reported by the firms in their proxy statements.[18]

In order to identify the relation between institutional investor monitoring and executive compensation, we restrict the sample to years prior to 1998. During the early

[17] Garvey and Swan (2002) also argue that the more informative stock prices that result from increased liquidity are better benchmarks on which to base executive compensation. They find a direct relation between the use of incentive compensation and liquid stock prices. In contrast to their work examining this direct relation between compensation and stock liquidity, we focus on the interaction term between the concentration of institutional investor ownership and the cost of monitoring.

[18] Some firms list less than five top executives in their proxy statement.

and mid-1990s, the idea of tying executive compensation to firm performance through stock or option grants was generally viewed positively. (See, for example, *Financial Times,* 1995.) By contrast, during the last years of the decade, certain types of compensation (particularly option compensation) became increasingly controversial and even viewed negatively by some institutional investors. (See Lublin and Scism, 1999.)[19]

A. Measures of compensation

We employ a number of measures of the structure of managerial compensation. We use the level of pay, where pay is alternatively defined as salary or total direct compensation (i.e., the sum of salary, bonus, option and stock grants, long-term incentive plan payouts, and other compensation). In addition, we use four measures of the pay-for-performance sensitivity of managerial compensation. The first measure focuses solely on the options granted to managers: the sensitivity of option grants to changes in stock price (Yermack, 1995). The second measure includes stock grants with option grants in order to calculate the sensitivity of these two types of incentive pay to changes in stock price. The third measure focuses on cash compensation: the sensitivity of salary plus bonus to changes in shareholder wealth (Jensen and Murphy, 1990). Finally, the fourth measure combines these sources of compensation along with other types of compensation: the sensitivity of total direct compensation to changes in shareholder wealth (Jensen and Murphy, 1990).[20]

To calculate each executive's option-grant sensitivity, we use the methodology suggested by Yermack (1995). First, we calculate the delta of every option grant, $\partial C/\partial P$

[19] In addition, even if one wanted to include the most years in the sample, the classification of institutional investors into types by Thomson Financial is problematic starting in 1998. This renders the post-1997 data as usable only after a high cost of manually re-classifying each institution into its proper type. See http://wrds.wharton.upenn.edu/ds/tfn/sp34/doc.shtml for a discussion of this issue.

[20] Substantial differences across measures of compensation suggest the use of alternative measures in the tests. For instance, the correlation between "total direct compensation" and "salary plus bonus" is 0.55.

(where C is the value of the call option and P is the price of the stock), by using the Black-Scholes model modified for dividends. (We derive dividend yields and volatilities from the Center for Research in Securities Prices (CRSP) data.[21]) We then multiply the delta of the option grant by the number of options granted and divide by the number of shares outstanding at the beginning of the year. This number is the sensitivity of the option grant per dollar change in share value. Multiplying it by 1,000 gives the familiar dollar change in managerial wealth per $1,000 change in shareholder wealth. For years in which executives receive multiple option grants, the sensitivities are aggregated over each year for each manager.

For our second measure of pay for performance, we add the sensitivity of each year's stock grants to this option-grant sensitivity, where each share of stock granted has a delta of one. Because the number of shares of stock granted in our sample is very small relative to the number of options granted, this measure is very highly correlated with our option-grant sensitivity measure (i.e., a correlation of nearly 1.0). Hence, to save space, we only present results using the option-grant sensitivity, but our results are robust to using a combined stock- and option-grant sensitivity measure.

Our four compensation measures are flow-based; we do not directly include changes in the value of the managers' previous stockholdings in our measures of compensation. Although managers may alter their portfolios and risk exposures in response to the composition of their pay package (Ofek and Yermack, 2000, or Bettis, Bizjak and Lemmon, 2001), we concentrate on the compensation components over which the board of directors has direct control and consequently the components that activist institutional shareholders could influence. This focus is consistent with the evidence in Core and Guay (1998) which shows that firms use the flow rather than the stock of equity incentives to reward past performance and to re-optimize incentives for

[21] Notably, the volatility used in both the delta and subsequently in constructing control variables follows the calculation in Yermack (1995). It is the standard deviation of logarithmic returns over the last 120 trading days of the fiscal year, annualized by multiplying by the square root of 254.

future performance. It is possible, though, that boards of directors incorporate managers' stockholdings into their compensation decisions. To control for this, we include the percentage of common stock owned by the manager as a control variable in all of our tests.

B. Measures of institutional monitoring

For every firm on the ExecuComp database, we obtain institutional equity holdings for each year between December 1991 and December 1996 from the CDA Spectrum database.[22] CDA Spectrum derives these holdings from institutional investors' 13-f filings. (Institutional investors with more than $100 million in equities must report their equity ownership to the SEC in quarterly 13-f filings.) Institutions file their holdings as the aggregate for their firm, regardless of how many individual fund portfolios they have. CDA Spectrum classifies institutional investors into five types: investment companies (mutual funds and closed-end funds), independent investment advisers (principally pension fund advisers), bank trust departments, insurance companies and others (miscellaneous institutions such as endowment funds or public pension funds).[23]

We use the CDA Spectrum classification to divide our institutions into the (potentially) active monitors, investment advisers and investment companies, and the (potentially) passive monitors, bank trust departments and insurance companies. The "other" category type according to CDA is a mix of endowment funds, self-managed corporate pension funds and a few public pension funds. Because this group has a mix of active and passive institutions, we take the conservative approach and categorize them as passive. However, since this category is a small proportion of the total

[22] Because we employ lagged institutional ownership variables in our tests, our institutional data precedes the compensation data by one year.

[23] Although public pension funds are not required to make 13-f filings, some of the public funds choose to do so voluntarily.

institutional ownership (less than 5% for our sample period), changing the group to active does not change our qualitative results.

After dividing the institutions into the active and passive categories, we calculate the concentration of each respective group's ownership in the firm as the percentages of total institutional ownership held by any of the firm's five largest institutional owners that come from each group. That is, for a given firm, the concentration of active institutions is the percentage of total institutional ownership held by the active institutions that are among the five largest institutional investors in the firm. Furthermore, to capture the cross-sectional variation in the firm-specific cost of monitoring, we interact total institutional concentration with the inverse of the firm's stock turnover, which we calculate as the trading volume from CRSP over the year, divided by the average shares outstanding.[24]

C. Control variables

Studies of institutional investors as well as studies of executive compensation have documented a number of systematic differences associated with certain firm characteristics. For example, institutional investment is related to firm size (Sias and Starks, 1997, and Gompers and Metrick, 2001) and firm performance (Nofsinger and Sias, 1999). Executive compensation is related to firm size (Baker, Jensen and Murphy, 1988, Murphy, 1998), firm performance (Smith and Watts, 1992) firm growth opportunities (Smith and Watts, 1992, and Harvey and Shrieves, 2001), and firm risk (Aggarwal and Samwick, 1999). In addition, firm characteristics that are related to potential moral hazard in the firm may influence optimal managerial compensation in the firm (e.g., Himmelberg, Hubbard and Palia, 1999).

[24] Since we are interacting turnover with the concentration of institutional ownership, it is similarly lagged.

Given these possible systematic relations, we include a number of control variables in our regressions. To measure firm size, we use both market capitalization and net sales, but we also obtain similar results if we use total assets. Several of our controls include a measure of the firm's capital stock; we follow Himmelberg, Hubbard and Palia (1999) and use the firm's net property, plant and equipment as a proxy for capital. We use four variables to control for the firm's investment and growth opportunities: *Tobin's q* ratio,[25] and the respective ratios of research and development expenses, advertising expenses, and capital expenditures to capital (*R&D/Capital*$_t$, *Advertising/Capital*$_t$, and *Investment/Capital*$_t$). Since research and development, advertising, and capital expenditures are often missing in Compustat when they may in fact be zero, we follow Himmelberg et al. and set missing values to zero and include in our tests indicator variables for whether these data are missing that control for any bias induced (*R&D Missing*$_t$, *Advertising Missing*$_t$, and *Investment Missing*$_t$).

We also include controls for the firm's leverage, (*Debt/Assets*$_t$), dividend policy (*Dividend Yield*$_t$), cash flow (*Cash Flow/Capital*$_t$), asset productivity ratio (*Capital/Sales*$_t$), diversification (*Number of Segments*$_t$, based on the number of business or operating segments from the Compustat segment data). Following Aggarwal and Samwick (1999), we control for firm risk by calculating each firm's dollar volatility, which is in turn calculated by multiplying the standard deviation of each firm's stock returns by its market capitalization.[26]

To control for differences in pay and pay-for-performance sensitivity across industries, we use industry indicator variables (at the two-digit SIC level). These

[25] We calculate Tobin's *q* as (the market value of equity less book value of equity plus book value of assets) divided by book value of assets.

[26] Our controls are calculated based on the following variables from the annual Compustat data: (total) assets, item 6; (net) property, plant and equipment, item 8; (long-term) debt, item 9; sales, item 12; cash flow (or earnings before interest, depreciation, and amortization), item 13; dividends per share, item 21; stock price, item 24; shares outstanding, item 25; capital expenditures, item 30; research and development expense, item 45; advertising expense, item 46; and book value of common equity, item 60.

variables also control for preferences institutional investors may have for particular industries. We use these controls rather than firm-specific fixed effects throughout our tests because doing so retains within-industry variation, while also allowing across-firm variation, which we expect to be empirically important. Our panel is relatively short (five years) and institutional ownership and firm-specific costs of monitoring are likely to be fairly stable over time, so we do not want to rely solely on the within-firm variation that would remain with firm fixed effects. Indicator variables for the year of the observation allow both pay-for-performance sensitivity and changes in pay to vary systematically across time. Finally, we control for differences between the CEO and other top executives in two ways. First, we use data on all five executives in the regression and employ a CEO indicator variable, equal to one if the executive is the CEO and zero otherwise. In particular, this variable controls for differences in the pay of CEOs versus the other top executives of the firm. Second, we run the regressions with the sample restricted to CEOs only.[27]

We obtain the data on firm characteristics from CRSP and Compustat. To be included in the final sample, a firm must have data available from all four sources (Execucomp, CDA Spectrum, CRSP and Compustat) for a given year. This requirement results in a final sample of 36,352 firm-executive-year observations, spread over 1,836 firms (out of the 1,914 firms in our Execucomp sample).

Table I provides the descriptive statistics for our sample with the managerial compensation variables in Panel A, the institutional investor ownership variables in Panel B, and the firm characteristic variables in Panel C. As shown in Panel A, the top five executives in the sample firms receive an average annual salary of about $301,000. The addition of option and stock grants, long-term incentive plan payouts, and other types of direct compensation brings their average annual total direct compensation to

[27] In some cases, ExecuComp does not designate which of the executives is the CEO. In this case, we assume the executive with the highest base salary is the CEO.

almost $1.25 million. The average annual change in compensation over our sample period is about $63,000 in salary plus bonus and about $201,000 in total direct compensation. Finally, the average option-grant sensitivity implies an expected change in value of almost $1 for each $1,000 change in shareholder wealth.

Panel B provides summary statistics for institutional ownership of the sample firms. Institutional investors hold an average of 52% of the outstanding equity in the sample firms. Statistics for our concentration measures show that large, active institutional investors (independent investment advisers and mutual funds) hold about 31% of all institutionally-owned shares, and large, passive institutional investors (banks, insurance companies and other institutions) hold about 13% of these shares.

Panel C of Table I provides summary statistics for the various firm characteristics and controls used in our empirical tests. *Share Turnover*, the inverse of which we use as our proxy for the firm-specific costs of monitoring, averages 1.17 in our sample, implying that an average firm has annual volume that is about 117% of the outstanding shares. Consistent with the high stock prices over our sample period, the average *Tobin's q* ratio is 1.94 (median of 1.49). Due to the Execucomp coverage requirement, our firms are quite large. The average firm has a market capitalization of $2.9 billion, with sales of $3.3 billion (medians of $923 million and $931 million, respectively). The average firm is not very highly levered (*Debt/Assets* of 0.18) and has a small dividend yield (0.017). Investment is large relative to R&D and advertising expenses, but *R&D/Capital* shows evidence of a skewed distribution (mean of 0.19 versus a median of zero). The average executive owns 1.1% of the firm's stock, but the median is much lower at 0.01%.

4. Empirical results

In this section, we present the results from empirical tests of the implications of the model developed in Section I. We first present the results from testing the hypotheses derived from Proposition 2 regarding the pay-for-performance sensitivity of managerial compensation. We then present the results from testing the hypotheses from Proposition 3 regarding the level of managerial compensation.

A. Pay-for-performance sensitivity

Proposition 2 implies that the pay-for-performance sensitivity of the manager's compensation is increasing in the monitoring shareholders' ownership and decreasing in the ratio of the cost of monitoring to its likelihood of success. In Section A.1, we examine these implications by measuring the pay-for-performance sensitivity implicit in the stock option grants in isolation (Yermack, 1995).[28] Then, in Section A.2, we examine the implications by measuring pay-for-performance sensitivity through a more comprehensive, ex post measure based on the effects on total compensation of changes in shareholder wealth (Jensen and Murphy, 1990).

A.1. Option-grant sensitivity

We focus on stock option grants in isolation for two reasons. First, over our sample period, options became not only an increasingly important component of executive pay (see Murphy, 1998), but also an instrument of compensation that was favorably viewed by institutional investors. Second, in contrast to other measures of pay-performance sensitivity, option-grant sensitivity is an ex ante sensitivity measure. Arguably, option sensitivity better captures the intended sensitivity of compensation to shareholder value

[28] Consistent with previous research (e.g., Yermack, 1995), we use the stock option grants alone in the sensitivity measure. As mentioned above, due to the relatively small number of shares involved, adding sensitivity due to stock grants produces very similar results.

rather than the realized sensitivity, which could be obscured by the occurrence of random shocks.

Because many firms do not pay option grants or do not pay them every year, we use a Tobit regression to examine the relation between firms' option-grant sensitivities and active versus passive institutional investor ownership concentration:

$$\Delta(\text{value of options granted per \$1000 in shareholder wealth})_{it} = \beta_1 (\text{active institutional concentration}_{it-1}) + \beta_2 (\text{passive institutional concentration}_{it-1}) + \beta_3 [(\text{total institutional concentration}_{it-1})*(\text{firm-specific cost of monitoring})] + \beta_4\Delta(\text{shareholder wealth})_{it} + \beta_5\Delta(\text{shareholder wealth})_{it-1} + \Sigma\beta_k (\text{other control variables}_{it}) + \Sigma\beta_y \text{ year indicator variables}_t,$$

where the concentration of active (passive) institutional ownership is measured by the percentage of institutionally-owned shares held by the five largest institutional holders that are active (passive). The slope coefficients on the active (passive) ownership concentration variables reflect estimates of the ratios of these investors' respective costs and probabilities of success in their monitoring. The firm-specific cost of monitoring proxy (the inverse of *Share Turnover*) is interacted with total institutional concentration. The slope on this variable provides an estimate of how monitoring by either type of institutional investor is reduced by the firm-specific costs.

The control variables are changes in shareholder wealth in the current and previous years, total institutional ownership, and further variables controlling for firm characteristics. We also include the percentage of shares in the firm owned by the executives, an indicator variable equal to one if the executive is a CEO, industry-level dummy variables equal to one for the two-digit SIC in which the firm operates, and year dummies equal to one if the observation is for the given year.[29] We use the concentration of institutional ownership (and firm-specific cost of monitoring) for the *prior* period because of our interest in the institutions' influence. For this regression as well as

[29] While Tobit models do not lend themselves to fixed-effects specifications, we obtain similar results if we include firm-level random effects.

subsequent regressions in which the unit of observation is an executive-year, we calculate standard errors that are robust to heteroskedasticity and within-firm correlation (i.e., clustering of errors by firm). This controls for a potential lack of independence across executives or time within each firm.

The results of the Tobit regressions are provided in Table II. The first two models report the results of the regressions that include all five of the top executives in the firm. Models 3 and 4 report the results of the regressions that restrict the sample to the CEOs. In all four specifications in Table II, pay-for-performance sensitivity is significantly related to active institutional ownership concentration, with estimated coefficients ranging from about 1.7 to 4.7 and t-statistics that range from 3.6 to 4.3. In contrast, passive institutional ownership concentration is significant in Models 2 and 4, and appears more weakly related, both statistically and economically (coefficients from 0.1 to 2.4 and t statistics from 0.2 to 2.0). This difference in sensitivity is statistically significant as shown by a Wald F-statistic for the equality of the regression statistics, which rejects the null at the 1% significance level in all four models. In addition, the interaction terms between the firm-specific monitoring cost and total institutional ownership concentration show that the effect of institutional monitoring through ownership concentration is substantially reduced in the cases with lower stock liquidity where monitoring is presumably more expensive. This result is consistent, for example, with the effects of an increase in monitoring costs (i.e., a reduction in liquidity) translating into a reduction in the monitoring intensity of institutional investors.

These findings support the implications of Proposition 2 that pay-for-performance sensitivity is increasing in the ownership concentration of the monitoring institutions, but decreasing in their monitoring costs. In addition, the differences between active and passive institutions are consistent with our prior belief that an institution's intensity of monitoring activity is related to institutional-specific costs, such as differences in legal, regulatory or competitive environments, or differences in the potential for business

relations with the underlying firms. Taken together, the results support the hypothesis that one group of institutional investors (independent investment advisors and investment companies) possess a monitoring technology advantage over another group (bank and insurance companies).

These results also have substantial economic significance. For instance, according to the regression in Model 2 of Table II, conditional on a firm granting stock options to their top executives, a one standard deviation increase in the concentration of active institutional investor ownership would be associated with a $0.14 increase in the executives' option grant sensitivity.[30] Relative to the mean option-grant sensitivity of $0.99 and the median of $0.38, this effect is quite large. As an alternative economic interpretation, a non-granting firm (i.e., a censored observation in the Tobit model) would be 24% more likely to grant options for the same change in concentration. For the CEO in isolation, the economic significance is even greater: from Model 4, given a firm that is granting options, a one standard deviation increase in active investor concentration would be associated with a $1.52 increase in stock-option sensitivity. Alternatively, this same change would make a non-granting firm 26% more likely to grant options (all else equal). These latter results are consistent with our finding that the option grants of CEOs have more pay-for-performance sensitivity than those of other executives, which one would expect given the increased responsibility and discretionary ability they generally have.

The coefficients on the control variables confirm previous findings in the literature. For instance, we find that the pay-for-performance sensitivity of option grants is increasing in total institutional ownership supporting the importance of clientele effects. In other words, institutional investors, as a group, are attracted to firms with

[30] Note that due to the use of a Tobit, the coefficients cannot just be multiplied by changes in right-hand side variables to generate predicted changes; one must account for the probability of censoring.

greater pay-for-performance sensitivity of their option grants (see, for example, Clay, 2001, or Hartzell and Starks, 2003).[31]

We also find that option-grant sensitivity is positively related to R&D expenses, and inversely related to a firm's dividend yield and the percentage of the firm owned by executives. This result is consistent with the Smith and Watts (1992) finding that firms with more growth opportunities (i.e., greater R&D or less dividends) provide more incentive compensation for their executives. The option-grant sensitivity is positively related to the firm's ratio of investment to capital, which is consistent with Himmelberg, Hubbard and Palia's (1999) result for managerial ownership.

A.2. Long-run changes

Table II provides evidence of differences between executive compensation structures and the type of institutional investor with concentrated holdings in the firm. While these differences are suggestive of the influence of institutions on compensation, examining lead-lag effects among ownership and compensation provides further confirmatory evidence of the influence. Specifically, we expect that if the institutional ownership concentration of the monitoring investors increases in a firm and these institutions provide monitoring of managerial compensation, then there would be subsequent changes in the structure of the executive compensation.

To examine this, we divide our sample into two subperiods, 1991 to 1994 and 1995 to 1997. For each firm, we calculate the change in active and passive ownership concentrations over the early subperiod, i.e., 1994 concentration less 1991 concentration. We next use the following procedure to estimate the change in option-grant sensitivity across the two subperiods. First, we calculate the average sensitivity over the base period by summing the option deltas for the top executives of each firm in each year and taking an average (by firm). We then calculate the average option-grant

[31] This is in contrast with our analysis, which it is performed using institutional ownership concentration variables that are unlikely to be affected by such clientele effects.

sensitivity over the later period in an analogous manner and measure the change in sensitivity by subtracting the earlier average from the later average.

We regress the change in option-grant sensitivity for the 1995-1997 versus the 1992-1994 period on the following independent variables: the changes in institutional concentration over the 1991-1994 period, an interaction term between the average firm-specific costs of monitoring and the changes in total institutional concentration, and a set of control variables (including firm characteristics) averaged across the sample period, and industry indicator variables. Table III provides the results of the regressions with the interaction terms included only in the regression shown in Model 2.

Consistent with Table II, for active institutions we find a strong positive relation between the long-run change in option-grant sensitivity and the early change in ownership concentration. However, we also find a significantly positive relation between the long-run change in option-grant sensitivity and the early change in passive institutional concentration. These results suggest that changes in monitoring by all kinds of institutions have long-run effects on compensation. Also consistent with Table II, we find a significantly negative relation between the long-run change in option-grant sensitivity and the interaction between monitoring costs and institutional concentration, suggesting that institutions are sensitive to firm-specific monitoring costs.

The results in Table III not only confirm our previous results but also allow us to address a potential endogeneity concern over the positive relationship between institutional ownership concentration and pay-for-performance sensitivity (e.g., institutional ownership becomes more concentrated in firms that compensate managers more efficiently, rather than the concentration influencing firms' compensation practices). As Table III shows, changes in executive compensation are clearly preceded by changes in institutional ownership, a finding that renders this reverse causality interpretation implausible. In fact, if we run the reverse regression allowing changes in

compensation to predict changes in institutional concentration of ownership, we find no significant relation.[32]

A.3. Pay-for-performance sensitivity of cash and total direct compensation

As an alternative measure of executive pay-for-performance sensitivity, we consider the sensitivity reflected in the executive's cash or total direct compensation (Jensen and Murphy, 1990). Our tests on the relation between the categories of institutional investor concentration and this sensitivity are based on the following model:

$$\Delta(\text{manager's compensation})_{it} = \beta_1\Delta(\text{shareholder wealth})_{it-1} + \Delta(\text{shareholder wealth})_{it}*\{\beta_2(\text{active institutional concentration}_{it-1}) + \beta_3(\text{passive institutional concentration}_{it-1}) + \beta_4[(\text{total institutional concentration}_{it-1})*(\text{cost of monitoring})] + \beta_5[\text{total institutional ownership}_{it-1}) + \Sigma\beta_y \text{ year and industry indicator variables}_{it}\} + \Sigma\beta_k(\text{control variables}_{it})] + \Sigma\beta_y \text{ year indicator variables}_t,$$

where managerial compensation is measured by either salary plus bonus or by total direct compensation (the sum of salary, bonus, option and stock grants, long-term incentive plan payouts, and other compensation) and the control variables are the firm characteristics, the percentage of shares the executives own in the company, an indicator variable equal to one for each firm's CEO, industry-level indicator variables equal to one for the two-digit SIC in which the firm operates, and annual indicator variables equal to one if the observation was for the given year.[33]

[32] Although we would like to run similar tests using changes in our other measure of pay-for-performance sensitivity (based on Jensen and Murphy, 1990), this would require estimating changes in slope coefficients, which is much noisier than changes in (observable) option grants. As such, we run these tests only for changes in option-grant sensitivity.

[33] The year indicator variables enter the regression twice: once as intercept terms, and once interacted with the change in shareholder wealth. The industry indicators enter through interactions with the change in shareholder wealth. Thus, they control for time-specific variation in both changes in pay, and time- and industry-specific pay-for-performance sensitivity. Hall and Liebman (1998) show that pay-for-performance sensitivity has increased since the 1980s. We obtain qualitatively similar results if the firm-specific controls enter through interactions with the change in shareholder wealth rather than as separate variables. Given the results in Aggarwal and Samwick (1999), we include an interaction between changes in shareholder wealth and *Dollar Volatility*.

Table IV shows the results from this regression for all executives in Panel A and for CEOs only in Panel B. The first two models of each panel show the relation using salary plus bonus and the third and fourth models show the relation using total direct compensation. Consistent with Table II, we find substantial differences in the relation between the pay-for-performance sensitivity of executive compensation and institutional concentration across the different types of institutions. Active institutional concentration has a significant positive relation for all four models in Panel A and for the models using total direct compensation in Panel B, while the passive institutional concentration has no significant relation. Further, Wald tests show that the coefficients for the two types of institutions are significantly different in all but the CEO-only regressions using total direct compensation (where active concentration is significant at the 10% level). However, we find no significant relation between this measure of pay-for-performance sensitivity and the cost of monitoring-ownership concentration interaction term. The difference in this result between the option-grant sensitivity specification and the change in compensation specification suggests that firm-specific costs of monitoring play a greater role in monitoring option compensation than cash or total compensation.

The results in Table IV concerning the relation between pay-for-performance sensitivity and institutional ownership concentration are consistent with Proposition 2, which suggests heterogeneity in monitoring technologies across various types of institutions, as reflected in stronger pay-performance sensitivity in the firm's incentive compensation.

B. Level of managerial compensation

Proposition 3 implies that the level of managerial compensation should be decreasing in the level of the institutional investors' involvement (especially for active institutions), although the cost of monitoring can mitigate this influence. To test these implications, we run the following regressions:

$$\text{Level of manager's compensation}_{it} = \beta_1 \Delta(\text{shareholder wealth})_{it} + \beta_2 \Delta(\text{shareholder wealth})_{it-1} + \beta_3 (\text{active institutional concentration}_{it-1}) + \beta_4 (\text{passive institutional concentration}_{it-1}) + \beta_5 [(\text{total institutional concentration}_{it-1})*(\text{cost of monitoring})] + \Sigma\beta_k (\text{control variables}_{it}),$$

where the level of compensation is measured by either salary or by total direct compensation (the sum of salary, bonus, option and stock grants, long-term incentive plan payouts, and other compensation). We employ the same control variables as in the previous tests, although here, we focus on salary rather than salary plus bonus since compensation of risk-averse managers are likely to be based on salaries over other forms of compensation.

However, the use of total direct compensation as the dependent variable raises an additional concern. As shown by Hall and Murphy (2002), when managers are risk averse, the company's cost of providing a compensation package can be substantially higher than the manager's value derived from receiving the package. This issue is relevant in our regressions because, in our sample, compensation packages are composed primarily of the firm's stocks and options, which can strongly affect the comparison across firms. In addition, the association between active institutions and stock-option grants shown in the previous sections could lead to a positive relation between (unadjusted) total compensation and the presence of active institutions.

To address these concerns, we include in the regressions two interaction variables that we build by multiplying the value of both option and stock grants by the firm's stock-price volatility. Arguably, the gap between the firm's cost of the total compensation and its value to the executive should be increasing in the riskiness of the firm's stock and the portion of pay that is based on stock price, therefore the interaction terms should capture at least part of the increase in compensation due to the increase in (firm-based) risk.[34]

[34] As an alternative to the controls for volatility and stock and option grants in Models 3 and 4 in Table V, we also tried re-calculating *Total Direct Compensation* after reducing the (Black-Scholes) option-grant values and stock-grant values by some of the ratios documented in Hall and Murphy (2002). These adjustments were identical for all firms, executives, and years, and

Panel A of Table V presents the results of these regressions using all of the top executives, with salary as the dependent variable in Models 1 and 2 and total direct compensation as the dependent variable in Models 3 and 4. Panel B presents the results for the same four regressions using CEOs only. Overall, the results in both Panels A and B show that increased concentration of ownership by both active and passive institutional investors is associated with lower levels of salary or total direct compensation. The point estimates of the coefficients on active ownership concentration are greater than the corresponding point estimates on passive concentration in every model. But, one cannot reject the null that the coefficients are equal for any of the models. These results are consistent with those of Hartzell and Starks (2003), who find that increased concentration by institutional investors as a group is associated with lower levels of managerial compensation, controlling for other factors influencing compensation such as firm size, performance and industry.

In terms of the control variables in Table V, the regression results show that the top executives' salary levels are slightly negatively related to the previous year's changes in shareholder wealth. In contrast, the levels of the executives' total direct compensation are increasing in the current year's changes in shareholder wealth, but are unrelated (or weakly related for CEOs) to the previous year's changes in shareholder wealth. We also find that firms with higher *Tobin's q* tend to have lower salaries and total compensation. This relation suggests that firms with growth opportunities pay less current compensation, possibly because the managers of these firms can expect to receive more in the future due to the expected growth. As would be expected,

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were therefore noisy. We then ran the regressions with the adjusted compensation measures as the dependent variable and excluded the volatility-interaction controls. Starting with no adjustment and excluding our controls for volatility, the estimated coefficient for potentially passive institutional concentration is more negative than the coefficient for potentially active institutional concentration. But, as one increases the size of the reduction in value to stock and option grants over the range of Hall and Murphy's estimates, this gap shrinks and the direction changes. For example, using a ratio of executive- to firm-value of 0.3 for options and 0.5 for stock, we find that the estimated coefficient for potentially active institutional concentration is more negative than the coefficient for potentially passive institutional concentration.

executives of larger firms and CEOs earn more. Consistent with Aggarwal and Samwick (1999), the sensitivity of pay to changes in shareholder wealth is decreasing in *Dollar Volatility*.[35]

Finally, the control variables added to capture the Hall and Murphy (2002) argument regarding the difference between the cost of compensation to the company and the value of that compensation to the executive show that the total level of executive compensation is increasing in the riskiness and amount of stock-based compensation. These results are consistent with the Hall and Murphy hypothesis.

In summary, the results on the levels of executive compensation are, by and large, consistent with the implications of Proposition 3 that the level of compensation decreases with the proportional ownership of the monitoring institutional investor. Furthermore, our results suggest that both types of institutional investors serve a monitoring role, but that the costs of monitoring an individual firm do not have as strong an influence on that monitoring as is the case with option-grant sensitivity in isolation.

5. Conclusions

We provide a stylized model that illustrates the relation between the structure of managerial compensation and the ownership of institutional investors that serve a monitoring function. The model's primary predictions are that managers' pay-for-performance sensitivity should be increasing in the proportional ownership of the monitoring institutions, while the level of pay should be decreasing in that ownership. A further implication is that these effects should be attenuated in firms where the cost of institutional monitoring is higher.

We examine the model's implications by segmenting institutional investors into two groups that, arguably, differ in their willingness to monitor due to differences in their

[35] We obtain qualitatively similar results if we instead use Aggarwal and Samwick's (1999) specification of the pay-performance relation, including firm-specific fixed effects.

costs of monitoring, related to differences in their legal, regulatory and competitive environments as well as the likelihood of current or future business dealing with the firms they own. For each of these two groups, we calculate the concentration of institutional investors as a measure of the strength of their ownership. We use (the inverse of) share turnover as a proxy for the firm-specific cost of institutional monitoring relative to its benefits, as information flows should be greater for more liquid stocks, making it easier to efficiently identify and replace poor managers. Using these proxies, we test the implications of the model with a sample of executive compensation data.

The results of our empirical analysis are consistent with the implications of our model that more active institutional investors can provide more intense monitoring of corporate management. Pay-for-performance sensitivity is positively related to the concentration of (potentially) active institutions, and changes in that concentration are associated with future increases in pay-for-performance sensitivity. Both salary and total direct compensation are negatively related to the concentration of (potentially) active institutions. Consistent with the model, (potentially) active institutions have stronger associations with pay-for-performance sensitivity than their passive counterparts. For levels of compensation, we find significant negative relations with the concentrations of both types of institutions, consistent with all institutions monitoring levels of pay, but institutions with better monitoring capabilities having the significant effect on pay for performance. In summary, the results imply that investment companies and independent investment advisers play a more active monitoring role than do other types of institutions, consistent with the Brickley, Lease and Smith (1988) results that these institutions are more likely to vote their proxies against management.

Our results on the relative cost of monitoring are also broadly consistent with the model. We find that our proxy for the costs of monitoring are significant in the case of option-grant sensitivity, suggesting that institutional monitoring can be affected by the liquidity of the firm's equity.

Our results have important implications for the governance debate of the corporation. Many (including Warren Buffet) have suggested that mutual fund and pension fund managers should become more involved in the monitoring of the corporations in which they hold equity (Bies, 2003, and Gibbs, 2003). The cost of monitoring should be an important consideration in this debate. Further, if potential business relations have an effect on these costs of monitoring and if employer-sponsored defined contribution pension plans become an important source of new fund flows for the mutual fund and pension fund managers, then such potential business relations imply that these institutions may have greater costs in monitoring corporations. Further examination of these issues is an important topic that warrants additional research.

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Table I
Descriptive Statistics

This table reports the descriptive statistics for the primary compensation and institutional ownership variables. Panel A shows the executive compensation variables over the 1992-1997 time period. *Total Direct Compensation* is the sum of the manager's salary, bonus, stock and option grants, and other compensation. *Option-Grant Sensitivity* is the dollar change in the value of options granted per $1,000 change in shareholder wealth, calculated using the methodology in Yermack (1995). Panel B shows the institutional investor holdings over the 1991-1996 time period (in the empirical tests, institutional holdings and share turnover are lagged by one year). *Total Institutional Ownership* is the fraction of shares outstanding held by institutional investors. *Concentration of Potentially Active Institutions* is calculated as the fraction of all institutional ownership that is held by the five largest institutional investors for the firm that are either independent investment advisors or investment companies. *Concentration of Potentially Passive Institutions* is the fraction of all institutional ownership held by the remainder of the five larges institutional owners for the firm (primarily banks and insurance companies). Panel C shows firm characteristics. *Share Turnover* is the annual volume divided by the average shares outstanding for the year, as of time institutional ownership is measured. *Tobin's q* is the sum of the market value of equity and book value of assets, less book value of common equity, all divided by the book value of assets. *Market Capitalization* is the product of shares outstanding and year-end price per share, in millions of dollars. *Sales* is also in millions of dollars. *Debt/Assets* is the ratio of long-term debt to total assets. For the control variables, *Capital* is the firm's net property, plant, and equipment; *Investment* is capital expenditures; and *R&D* and *Advertising* are research and development, and advertising expenses, respectively. *R&D Missing*, *Advertising Missing*, and *Investment Missing* are indicator variables for respective missing data items in Compustat; for ratios involving these items, missing values are set to zero. *Number of Segments* is the number of operating or business segments per the Compustat segment files. *Percentage Shares Owned* is the fraction of shares outstanding owned by the executive per Execucomp. *Dollar Volatility* is the product of Market Capitalization and the annualized standard deviation of the firm's daily logarithmic stock returns over the last 120 days of the year (in millions of dollars).

Panel A: Executive compensation (in $1,000, except *Option-Grant Sensitivity and Option+Stock-Grant Sensitivity:* $ per $1000)

	Mean	Median	Standard Deviation	25th %	75th %
Salary	301.29	246.00	205.91	170.00	367.08
Total Direct Compensation	1,245.58	635.83	2,691.35	347.22	1,263.97
Δ(Salary + Bonus)	63.18	32.01	648.96	0.00	100.00
Δ(Total Direct Compensation)	200.97	50.67	2,695.38	-58.99	286.55
Option-Grant Sensitivity	0.99	0.18	3.16	0.00	0.75
Panel B: Institutional Ownership					
Total Institutional Ownership$_{t-1}$	52.2%	53.9%	19.3%	38.1%	67.0%
(% of shares outstanding)					
Concentration of:					
Potentially Active Institutions$_{t-1}$	31.0%	29.3%	15.7%	19.4%	40.0%
(% of institutional ownership)					
Potentially Passive Institutions$_{t-1}$	13.2%	9.9%	13.0%	4.1%	19.0%
(% of institutional ownership)					

Panel C: Firm Characteristics

Share Turnover$_{t-1}$	1.167	0.752	1.230	0.477	1.325
Tobin's q$_t$	1.925	1.489	1.315	1.160	2.164
Market Capitalization$_t$	3,603.89	923.19	9,668.83	348.01	2,943.75
Sales$_t$	3,322.16	931.30	8,780.84	354.12	2,872.82
Debt/Assets$_t$	0.184	0.161	0.160	0.043	0.290
Dividend Yield$_t$	0.017	0.012	0.021	0.000	0.026
R&D/Capital$_t$	0.186	0.000	0.186	0.000	0.096
R&D Missing$_t$	0.513	1.000	0.500	0.000	1.000
Capital/Sales$_t$	0.540	0.246	1.048	0.136	0.554
Cash Flow/Capital$_t$	0.942	0.497	2.933	0.238	1.023
Advertising/Capital$_t$	0.070	0.000	0.444	0.000	0.000
Advertising Missing$_t$	0.778	1.000	0.416	1.000	1.000
Investment/Capital$_t$	0.233	0.196	0.180	0.116	0.311
Investment Missing$_t$	0.074	0.000	0.262	0.000	0.000
Number of Segments$_t$	1.863	1.000	1.374	1.000	3.000
Percentage Shares Owned$_t$	0.011	0.001	0.042	0.000	0.003
Dollar Volatility$_t$	960.54	284.10	2638.85	121.22	773.71

Table II
Tobit Analysis of Pay-for-Performance Sensitivity of Option Grants As a Function of Active or Passive Institutional Investor Concentration and Firm-Specific Cost of Monitoring

Dependent variable: Δ in Value of Options Granted per $1,000 Δ in Shareholder Wealth

This table shows the coefficients from Tobit regressions of the change in the value of options granted a manager per $1,000 change in shareholder wealth against the concentration of potentially active and potentially passive institutional holdings, plus an interaction between total institutional ownership concentration and the cost of monitoring. Also included as controls are the current and lagged changes in shareholder wealth, controls for percentage total institutional ownership, executive ownership, and firm-specific controls. *Total Institutional Concentration* is the sum of *Potentially Active* and *Potentially Passive Concentrations*. *Δ(Shareholder Wealth)* is defined as the product of the annual return to shareholders and the beginning-of-year *Market Capitalization*. *Firm-Specific Cost of Monitoring* is defined as the inverse of the firm's *Share Turnover*. *CEO* is an indicator variable for observations for the firm's CEO. For this table, *Δ(Shareholder Wealth)*, *Market Capitalization*, *Sales*, and *Dollar Volatility* are in billions of dollars. Other variables are as defined in Table I. Models (1) and (2) show the results including all executives in the firm with the CEO indicator variable. Models (3) and (4) show the results with only CEOs included. Further control variables are indicator variables for the firm's two-digit SIC industry and for the year of the observation. (The coefficients for the latter variables are not shown in the table.) T-statistics are provided in parentheses. One, two, and three asterisks denote significance at the 0.10, 0.05, and 0.01 levels, respectively, and standard errors are corrected for clustering within firms. The table also provides Wald F-tests for the equality of the regression coefficients for the active versus passive institutional groups.

Independent Variables	All Execs	All Execs	CEOs	CEOs
	(1)	(2)	(3)	(4)
Potentially Active Institutional Concentration$_{t-1}$	1.697***	2.311***	3.524***	4.706***
	(4.06)	(4.97)	(3.58)	(4.33)
Potentially Passive Institutional Concentration$_{t-1}$	0.083	0.967*	0.602	2.350**
	(0.17)	(1.88)	(0.54)	(1.97)
Total Institutional Concentration$_{t-1}$ *X*		-0.27***		-0.55***
Firm-Specific Cost of Monitoring$_{t-1}$		(-3.07)		(-3.09)
Δ *(Shareholder Wealth*$_t$*)*	0.007	0.004	0.031	0.028
	(0.65)	(0.35)	(1.22)	(1.10)
Δ *(Shareholder Wealth*$_{t-1}$*)*	-0.010	-0.008	-0.011	0.008
	(-1.03)	(-0.83)	(-0.49)	(-0.35)
Total Institutional Ownership$_{t-1}$	0.580**	0.413	1.327*	1.018
	(2.06)	(1.45)	(1.88)	(1.43)
Tobin's q$_t$	-0.017	-0.005	-0.031	-0.010
	(-0.34)	(-0.09)	(-0.26)	(-0.08)
Market Capitalization$_t$	0.005	0.001	-0.027	-0.018
	(-0.70)	(-0.16)	(-1.37)	(-0.93)
Sales$_t$	0.004	0.003	0.012	0.010
	(1.20)	(0.97)	(1.47)	(1.29)
Debt/Assets$_t$	0.085	0.004	0.967	0.843
	(0.24)	(0.01)	(1.05)	(0.91)

Dividend Yield$_t$	-14.399***	-12.096***	-27.993**	-24.012**
	(-2.85)	(-2.74)	(-2.47)	(-2.38)
R&D/Capital$_t$	0.266**	0.242**	0.488**	0.411**
	(2.22)	(2.14)	(2.47)	(2.37)
R&D Missing$_t$	-0.208*	-0.169	-0.514*	-0.421
	(-1.74)	(-1.41)	(-1.78)	(-1.46)
Capital/Sales$_t$	0.009	0.013	0.063	0.069
	(0.26)	(0.37)	(0.82)	(0.89)
Cash Flow/Capital$_t$	0.002	0.001	-0.029	-0.030
	(0.06)	(0.06)	(-0.54)	(-0.56)
Advertising/Capital$_t$	0.136	0.129	0.347	0.337
	(0.90)	(0.86)	(1.10)	(1.08)
Advertising Missing$_t$	0.128	0.140	0.222	0.249
	(1.31)	(1.43)	(0.85)	(0.96)
Investment/Capital$_t$	1.872***	1.675***	3.668***	3.277***
	(4.15)	(3.76)	(3.07)	(2.73)
Investment Missing$_t$	0.002	-0.014	0.218	0.151
	(0.01)	(-0.04)	(0.24)	(0.16)
Number of Segments$_t$	0.053	0.064*	0.071	0.082
	(1.46)	(1.72)	(0.97)	(1.13)
Percentage Shares Owned$_t$	-3.255**	-3.124*	-7.116***	-6.873***
	(-2.01)	(-1.91)	(-2.81)	(-2.71)
Dollar Volatility$_t$	-0.001	-0.009	0.021	0.001
	(-0.06)	(-0.45)	(0.42)	(0.03)
CEO	1.386***	1.382***		
	(18.34)	(18.09)		
Number of observations	30,860	30,370	6,479	6,378
Wald F-statistic for equality of coefficients for *Potentially Active* versus *Potentially Passive Concentration*	16.87***	12.75***	10.24***	7.04***

Table III
Long-run Change in Active and Passive Institutional Investor Concentration and Subsequent Change in Option-Grant Sensitivity

Dependent Variable: Change in Option-Grant Sensitivity (1995-7 vs. 1992-4)

This table shows the coefficients from a regression of the change in option-grant sensitivity against changes in two categories of institutional ownership concentration and an interaction between the change in total institutional ownership concentration and the firm-specific cost of monitoring, while controlling for changes in total institutional ownership, changes in shareholder wealth, the average levels of firm-specific control variables, and indicator variables for each two-digit SIC code (coefficients on these industry indicators are not reported). *Change in Option-Grant Sensitivity* is measured as the difference between the firm's average *Option-grant Sensitivity* over the years 1995-1997 and the average sensitivity over the years 1992-1994. These averages are calculated using the total sensitivity for all of the firm's executives. Changes in concentration are calculated as the respective differences between 1994 and 1991. Averages for the various variables are calculated over the entire sample. For this table, *Δ(Shareholder Wealth)*, *Market Capitalization*, *Sales*, and *Dollar Volatility* are in billions of dollars. Other variables are as defined in Table I. T-statistics are provided in parentheses. One, two, and three asterisks denote significance at the 0.10, 0.05, and 0.01 levels, respectively. The table also provides Wald F-tests for the equality of the regression coefficients for the changes in concentration of the active and passive institutional groups.

	(1)	(2)
Δ(Potentially Active Institutional Concentration$_{1994\text{-}1991}$)	3.765 **	7.169 ***
	(2.20)	(3.00)
Δ(Potentially Passive Institutional Concentration$_{1994\text{-}1991}$)	4.283 **	8.387 ***
	(2.18)	(3.25)
Δ(Total Institutional Concentration$_{1994\text{-}1991}$) X		-2.728 **
Average Firm-Specific Cost of Monitoring		(-2.14)
Δ(Total Inst'l Ownership$_{1994\text{-}1991}$)	1.304	1.359
	(0.81)	(0.82)
Average Δ(Shareholder Wealth)	-0.136	-0.130
	(-0.31)	(-0.44)
Average Tobin's q	-0.336	-0.343
	(-1.38)	(-1.41)
Average Market Capitalization	-0.03310	-0.01810
	(-0.31)	(-0.16)
Average Sales	-0.01490	-0.01900
	(-0.45)	(-0.56)
Average Debt/Assets	-1.417	-1.683
	(-0.77)	(-0.92)
Average Dividend Yield	14.846	18.070
	(0.92)	(1.10)
Average R&D/Capital	-0.146	-0.122
	(-0.25)	(-0.21)
Average R&D Missing	0.249	0.240
	(0.41)	(0.39)

Average Capital/Sales	0.444	0.580 *
	(1.41)	(1.82)
Average Cash Flow/Capital	0.273 *	0.295 **
	(1.88)	(2.03)
Average Advertising/Capital	-0.484	-0.576
	(-0.59)	(-0.70)
Average Advertising Missing	-1.034	-1.132
	(-1.39)	(-1.52)
Average Investment/Capital	-4.678 *	-5.150 **
	(-1.94)	(-2.12)
Average Investment Missing	-1.411	-1.401
	(-0.56)	(-0.55)
Average Number of Segments	0.035	0.060
	(0.20)	(0.34)
Average Percentage Shares Owned	-2.445	-0.511
	(-0.42)	(-0.09)
Average Dollar Volatility	0.301	0.258
	(0.69)	(0.55)
Number of observations	1,209	1,190
Adjusted R^2	0.010	0.017
Wald F-statistic for equality of coefficients for changes in *Potentially Active* versus change sin *Potentially Passive Concentration*	0.1	0.5

Table IV
Pay-for-Performance Sensitivity as a Function of Active or Passive Institutional Investor Concentration and Firm-Specific Cost of Monitoring

This table shows the coefficients from a regression of the change in the manager's compensation against the lagged change in shareholder wealth and interactions between the current change in shareholder wealth and (i) concentration of potentially active institutions, (ii) concentration of potentially passive institutions, (iii) an interaction between total institutional concentration and the firm-specific cost of monitoring, (iv) total institutional ownership, and (v) dollar volatility. We divide the final interaction with dollar volatility by 1,000 to aid in presentation of the coefficients. Other variables are as defined in Tables I and II. Also included but not presented are interactions between the change in shareholder wealth and indicator variables for the firm's two-digit SIC industry and for the year of the observation. The annual indicator variables also enter alone, as intercepts. T-statistics are provided in parentheses. One, two, and three asterisks denote significance at the 0.10, 0.05, and 0.01 levels, respectively, and standard errors are corrected for clustering within firms. The table also provides Wald F-tests for the equality of the regression coefficients for the active versus passive institutional group interactions. Panel B presents the same regressions for CEOs only.

Panel A. All Executives Dependent Variables:	$\Delta(Salary + Bonus)_t$	$\Delta(Salary + Bonus)_t$	$\Delta(Total\ Direct\ Compensation)_t$	$\Delta(Total\ Direct\ Compensation)_t$
Independent Variables	(1)	(2)	(3)	(4)
$\Delta(Shareholder\ Wealth_{t-1})$	-0.0013	-0.0012	0.0451	0.0457
	(-0.34)	(-0.33)	(1.28)	(1.30)
$\Delta(Shareholder\ Wealth_t)$ X				
Potentially Active Institutional Concentration$_{t-1}$	0.079**	0.088**	0.582**	0.677**
	(2.53)	(2.20)	(2.22)	(2.08)
Potentially Passive Institutional Concentration$_{t-1}$	-0.015	-0.011	0.023	0.100
	(-0.49)	(-0.29)	(0.11)	(0.46)
Total Institutional Concentration$_{t-1}$ X		-0.001		-0.008
Firm-Specific Cost of Monitoring		(-0.74)		(-0.98)
Total Institutional Ownership$_{t-1}$	0.071***	0.071**	0.137	0.134
	(2.90)	(2.48)	(0.79)	(0.68)
Tobin's q_t	0.581	0.731	8.099	7.874
	(0.12)	(0.15)	(0.44)	(0.42)
Market Capitalization$_t$	0.000	0.001	-0.016	-0.010
	(0.13)	(0.53)	(-1.05)	(-0.63)
Sales$_t$	0.003***	0.004***	0.007	0.006
	(4.13)	(4.27)	(1.19)	(1.07)
Debt/Assets$_t$	-9.736	-11.230	-37.591	-42.264
	(-0.48)	(-0.54)	(-0.39)	(-0.43)
Dividend Yield$_t$	-609.977***	-618.411***	1,774.590	1,784.473
	(-4.25)	(-4.24)	(0.68)	(0.67)

R&D/Capital$_t$	-1.425	-1.589	20.435	19.338
	(-0.23)	(-0.25)	(1.06)	(1.00)
R&D Missing$_t$	-10.186	-10.495	-14.572	-18.586
	(-1.21)	(-1.23)	(-0.31)	(-0.39)
Capital/Sales$_t$	1.860	1.956	-8.671	8.614
	(0.76)	(0.78)	(-0.93)	(-0.92)
Cash Flow/Capital$_t$	1.311	1.236	14.505	14.083
	(0.31)	(0.30)	(1.27)	(1.23)
Advertising/Capital$_t$	18.811	19.218	107.283**	109.467**
	(1.14)	(1.16)	(2.47)	(2.51)
Advertising Missing$_t$	0.352	1.402	57.103	62.349
	(0.05)	(0.22)	(1.36)	(1.48)
Investment/Capital$_t$	-48.754*	-48.504*	-19.857	-12.756
	(-1.92)	(-1.89)	(-0.12)	(-0.08)
Investment Missing$_t$	-8.902	-9.520	-73.810	-78.566
	(-0.49)	(-0.52)	(-1.06)	(-1.11)
Number of Segments$_t$	5.841**	5.835**	10.152	11.556
	(2.33)	(2.41)	(0.55)	(0.63)
Percentage Shares Owned$_t$	-201.460***	-195.520***	-646.850**	-601.425***
	(-5.19)	(-5.16)	(-2.74)	(-2.67)
Dollar Volatility$_t$	-0.009*	-0.011*	0.111*	0.093
	(-0.88)	(-1.09)	(1.74)	(1.44)
Dollar Volatility$_t$ *X*	-0.0003*	-0.0003	0.0032*	-0.0030*
Δ*(Shareholder Wealth*$_t$*)*	-1.84	(-1.09)	(-1.79)	(-1.81)
CEO Dummy	72.124***	71.966***	243.597**	241.197***
	(15.38)	(15.23)	(6.84)	(6.74)
Number of observations	30,992	30,502	25,389	25,003
Adjusted R^2	0.027	0.026	0.040	0.040
Wald F-statistic for equality of coefficients *for Potentially Active* versus *Potentially Passive Concentration*	9.5***	9.6***	4.6**	4.2**

Panel B. CEOs Only

	Δ (Salary + Bonus)$_t$	Δ (Salary + Bonus)$_t$	Δ(Total Direct Compensation)$_t$	Δ(Total Direct Compensation)$_t$
	(1)	(2)	(3)	(4)
Δ (Shareholder Wealth$_{t-1}$)	0.0043	0.0043	0.1429	0.1393
	(0.38)	(0.38)	(1.23)	(1.20)
Δ (Shareholder Wealth$_t$) X Potentially Active Institutional Concentration$_{t-1}$	0.098	0.087	1.067 *	1.204 *
	(0.96)	(0.56)	(1.83)	(1.65)
Potentially Passive Institutional Concentration$_{t-1}$	-0.118	-0.131	-0.057	0.081
	(-0.97)	(-0.82)	(-0.13)	(0.18)
Total Institutional Concentration$_{t-1}$ X		0.001		-0.009
Firm-Specific Cost of Monitoring		(0.22)		(-0.55)
Total Institutional Ownership$_{t-1}$	0.198 **	0.210 *	0.536 *	0.556 *
	(2.12)	(1.72)	(1.85)	(1.66)
Tobin's q_t	12.761	13.273	28.948	28.778
	(0.58)	(0.60)	(0.54)	(0.53)
Market Capitalization$_t$	0.005	0.006	-0.001	0.015
	(0.69)	(0.83)	(-0.01)	(0.30)
Sales$_t$	0.008 ***	0.008 ***	0.010	0.009
	(4.11)	(3.93)	(0.62)	(0.55)
Debt/Assets$_t$	-48.514	-51.573	-152.752	-154.033
	(-0.60)	(-0.62)	(-0.52)	(-0.51)
Dividend Yield$_t$	-1,022.301 ***	-1,030.123 ***	1,251.072	1,336.955
	(-2.64)	(-2.63)	(0.30)	(0.32)
R&D/Capital$_t$	-16.579	-17.233	22.049	-25.711
	(-0.56)	(-0.57)	(0.33)	(-0.38)
R&D Missing$_t$	-53.356	-53.218	25.359	22.492
	(-1.31)	(-1.31)	(0.17)	(0.15)
Capital/Sales$_t$	8.068	8.355	-17.056	-16.589
	(0.84)	(0.86)	(-0.73)	(-0.70)
Cash Flow/Capital$_t$	-9.632	-9.786	8.948	7.851
	(-0.45)	(-0.45)	(0.23)	(0.20)
Advertising/Capital$_t$	77.443	78.104	227.325 *	231.652 *
	(0.93)	(0.94)	(1.70)	(1.73)

Advertising Missing$_t$	-3.399	-1.660	84.066	94.412
	(-0.19)	(-0.09)	(0.69)	(0.77)
Investment/Capital$_t$	-134.769	133.596	-141.594	-120.990
	(-1.46)	(-1.44)	(-0.35)	(-0.29)
Investment Missing$_t$	34.593	34.507	-137.741	-147.684
	(0.57)	(0.55)	(-0.79)	(-0.84)
Number of Segments$_t$	16.290	15.159 *	3.246	-6.940
	(1.60)	(1.66)	(0.05)	(-0.11)
Percentage Shares Owned$_t$	-140.638 *	-145.260 **	-419.602	-368.334
	(-1.88)	(-2.33)	(-1.03)	(-0.97)
Dollar Volatility$_t$	-0.054	-0.061	0.116	0.065
	(-1.32)	(-1.37)	(0.61)	(0.34)
Dollar Volatility$_t$ *X*	-0.0008 *	-0.0009	-0.0048	-0.0048
Δ*(Shareholder Wealth*$_t$*)*	(-1.76)	(-1.55)	(-1.17)	(-1.17)
Number of observations	6,507	6,406	5,884	5,796
Adjusted R^2	0.089	0.089	0.115	0.115
Wald F-statistic for equality of coefficients *for Potentially Active* versus *Potentially Passive Concentration*	6.5 **	6.6 **	2.3	2.1

Table V
Level of Executive Compensation as a Function of Active or Passive Institutional Investor Concentration and Firm-Specific Cost of Monitoring

This table shows the coefficients from a regression of manager compensation against the concentration of potentially active and potentially passive institutional holdings, plus an interaction between total institutional ownership concentration and the cost of monitoring. Included are controls for current and lagged changes in shareholder wealth, total institutional ownership, and several firm-specific factors, plus a series of (unreported) indicator variables for the firm's two-digit SIC industry and for the year of the observation. For the regressions using *Total Direct Compensation*, additional controls are interactions between the standard deviation of the firm's stock returns (as defined in Table I) and the respective values of options and stock grants (*Volatility X Options* and *Volatility X Stock*). Other variables are as defined in Tables I and II, and IV. T-statistics are provided in parentheses. One, two, and three asterisks denote significance at the 0.10, 0.05, and 0.01 levels, respectively, and standard errors are corrected for clustering within firms. Wald F-tests for the equality of the regression coefficients for the active versus passive institutional groups fail to reject equality at conventional significance levels in all regressions. Panel A provides the results for the sample of all top five executives and Panel B provides the results for the subsample of CEOs only.

Panel A. Top Five Executives

Dependent variable	*Salary*	*Salary*	*Total Direct Comp*	*Total Direct Comp*
	(1)	(2)	(3)	(4)
Potentially Active Institutional Concentration$_{t-1}$	-236.660***	-242.196***	-705.988***	-695.478***
	(-10.79)	(-10.34)	(-4.88)	(-4.36)
Potentially Passive Institutional Concentration$_{t-1}$	-209.874***	-219.221***	-585.958***	-590.715***
	(-8.71)	(-7.61)	(-3.15)	(-2.90)
Total Institutional Concentration$_{t-1}$ *X*		2.41		6.49
Firm-Specific Cost of Monitoring		(0.39)		(0.22)
Δ*(Shareholder Wealth*$_t$*)*	0.001	0.001	0.053***	0.049***
	(0.47)	(0.31)	(3.35)	(2.93)
Δ*(Shareholder Wealth*$_{t-1}$*)*	-0.004*	-0.004*	0.019	0.022*
	(-1.74)	(-1.64)	(1.59)	(1.73)
Total Institutional Ownership$_{t-1}$	109.821***	111.705***	416.732***	417.056***
	(7.46)	(7.39)	(4.61)	(4.52)
Tobin's q$_t$	-8.377***	-8.312***	-36.213***	-34.697***
	(-3.74)	(-3.66)	(-2.81)	(-2.62)
Market Capitalization$_t$	0.003***	0.004***	0.061***	0.070***
	(2.37)	(2.92)	(4.06)	(4.73)
Sales$_t$	0.004***	0.004***	0.014***	0.017***
	(5.85)	(5.53)	(3.01)	(3.58)
Debt/Assets$_t$	91.995***	92.346***	128.817	122.994
	(4.71)	(4.67)	(1.10)	(1.05)

Dividend Yield$_t$	115.775	90.469	4,846.541	4,727.114
	(0.82)	(0.62)	(1.60)	(1.51)
R&D/Capital$_t$	1.264	1.503	-4.047	-3.028
	(0.52)	(0.60)	(-0.13)	(-0.10)
R&D Missing$_t$	2.434	2.476	56.146	52.108
	(0.25)	(0.25)	(1.11)	(1.02)
Capital/Sales$_t$	-3.314 *	-3.641 *	-19.920	-20.327
	(-1.67)	(-1.74)	(-1.44)	(-1.45)
Cash Flow/Capital$_t$	-0.006	-0.036	16.628	16.614
	(0.00)	(-0.03)	(1.58)	(1.58)
Advertising/Capital$_t$	28.102 ***	28.451 ***	19.439	22.129
	(3.02)	(3.06)	(0.39)	(0.44)
Advertising Missing$_t$	-6.894	-5.189	-75.901 **	-62.280 *
	(-0.84)	(-0.62)	(-2.04)	(-1.68)
Investment/Capital$_t$	-77.492 ***	-76.247 ***	-470.431 ***	-476.918 ***
	(-5.45)	(-5.32)	(-4.55)	(-4.59)
Investment Missing$_t$	-28.104 *	-27.433 *	-214.952	-231.227 *
	(-1.73)	(-1.68)	(-1.64)	(-1.77)
Number of Segments$_t$	13.233 ***	12.126 ***	59.705 ***	50.935 ***
	(5.93)	(5.69)	(4.33)	(4.07)
Percentage Shares Owned$_t$	113.728	120.396	-519.652 *	-490.915 *
	(1.45)	(1.55)	(-1.85)	(-1.76)
Dollar Volatility$_t$	0.009 *	0.006	-0.183 ***	-0.212 ***
	(1.73)	(1.39)	(-3.24)	(-3.88)
Dollar Volatility$_t$ X	-0.0002 **	-0.0002 **	-0.0010 **	-0.0009 **
Δ(Shareholder Wealth$_t$)	(-2.46)	(-2.52)	(-2.24)	(-2.23)
Volatilty$_t$ X Options Grants$_t$			3.04 ***	3.04 ***
			(11.35)	(11.28)
Volatilty$_t$ X Stock Grants$_t$			4.16 ***	4.13 ***
			(10.25)	(10.07)
CEO Dummy	257.151 ***	256.683 ***	730.035 ***	728.784 ***
	(47.61)	(47.66)	(13.21)	(13.09)
Number of observations	30,992	30,502	30,271	29,801
Adjusted R^2	0.488	0.487	0.723	0.723

Panel B. CEOs only

Dependent variable	*Salary*	*Salary*	*Total Direct Comp*	*Total Direct Comp*
	(1)	(2)	(3)	(4)
Potentially Active Institutional Concentration$_{t-1}$	-377.181***	-373.643***	-1,653.521***	-1,535.518***
	(-8.22)	(-7.48)	(-3.95)	(-3.37)
Potentially Passive Institutional Concentration$_{t-1}$	-327.129***	-331.845***	-1,474.699***	-1,371.597***
	(-6.24)	(-5.25)	(-3.89)	(-3.03)
Total Institutional Concentration$_{t-1}$ X		-1.837		-23.99
Firm-Specific Cost of Monitoring		(-0.13)		(-0.33)
Δ(Shareholder Wealth$_t$)	0.001	0.001	0.096**	0.090**
	(0.30)	(0.15)	(2.45)	(2.15)
Δ(Shareholder Wealth$_{t-1}$)	-0.005	-0.004	0.056*	0.059*
	(-1.14)	(-1.08)	(1.88)	(1.91)
Total Institutional Ownership$_{t-1}$	228.972***	225.967***	762.792***	731.446***
	(7.34)	(6.97)	(3.55)	(3.29)
Tobin's q$_t$	-13.300***	-13.094***	-59.791**	-55.723**
	(-2.78)	(-2.69)	(-2.33)	(-2.12)
Market Capitalization$_t$	0.006**	0.007***	0.145***	0.166***
	(2.12)	(2.67)	(3.57)	(4.07)
Sales$_t$	0.006***	0.007***	0.022*	0.027**
	(4.72)	(4.72)	(1.95)	(2.47)
Debt/Assets$_t$	199.215***	201.199***	282.807	258.141
	(3.82)	(3.81)	(0.79)	(0.71)
Dividend Yield$_t$	524.004	505.425	7,185.345	7,105.102
	(1.56)	(1.45)	(1.58)	(1.52)
R&D/Capital$_t$	-2.472	-2.523	-45.608	-46.271
	(-0.47)	(-0.46)	(-0.78)	(-0.78)
R&D Missing$_t$	-20.052	-18.575	53.263	51.856
	(-1.02)	(-0.93)	(0.34)	(0.33)
Capital/Sales$_t$	-3.592	-4.245	-44.408	-45.714
	(-1.20)	(-1.33)	(-1.20)	(-1.21)
Cash Flow/Capital$_t$	-0.732	-0.793	16.982	17.094
	(-0.34)	(-0.37)	(0.73)	(0.74)

Advertising/Capital$_t$	42.803***	43.309***	34.136	38.587
	(2.96)	(2.99)	(0.29)	(0.33)
Advertising Missing$_t$	-11.308	-7.743	-142.590*	-112.840
	(-0.63)	(-0.43)	(-1.73)	(-1.36)
Investment/Capital$_t$	-166.162***	-165.605***	-851.265***	-887.086***
	(-5.56)	(-5.54)	(-3.10)	(-3.18)
Investment Missing$_t$	-47.518	-43.672	-300.665	-334.939
	(-1.35)	(-1.24)	(-1.08)	(-1.22)
Number of Segments$_t$	19.179***	17.147***	101.439***	87.481***
	(4.12)	(4.09)	(3.48)	(3.46)
Percentage Shares Owned$_t$	92.609	103.376	-232.400	-164.412
	(0.97)	(1.13)	(-0.48)	(-0.36)
Dollar Volatility$_t$	0.011	0.007	-0.438***	-0.505***
	(1.17)	(0.75)	(-3.02)	(-3.52)
Dollar Volatility$_t$ X	-0.0003**	0.0003**	-0.0019*	-0.0017*
Δ(Shareholder Wealth$_t$)	(-2.08)	(-2.08)	(-1.81)	(-1.80)
Volatilty$_t$ X Options Grants$_t$			3.08***	3.08***
			(9.59)	(9.55)
Volatilty$_t$ X Stock Grants$_t$			3.82***	3.79***
			(9.13)	(8.97)
Number of observations	6,507	6,406	6,354	6,258
Adjusted R^2	0.416	0.414	0.720	0.718