Monitoring, Contractual Incentive Pay, and the Structure of CEO Equity-Based Compensation

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Abstract

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I find that a CEO who is better monitored tends to have smaller total contractual incentive pay, measured by the delta of the CEO's total portfolio. The realized wealth-to-performance sensitivity (WPS) of such a CEO, however, is not significantly different from that of a CEO who is worse monitored. The findings suggest that monitoring and contractual incentives can be substitutes, rather than complements assumed by prior corporate governance research.

I further study how a firm manages the total contractual incentives provided to its CEO. I find that a firm adjusts the structure of equity-based compensation, specifically, the split between restricted stock and options, to manage it. Better monitored firms tend to have higher proportions of restricted stock in the CEO's total equity-based compensation. The higher ratio is associated with lower total contractual incentives and total pay level. The findings suggest that how a board provides equity-based compensation matters.

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I Introduction

Monitoring, whether by the board or external monitors such as blockholders or analysts, plays an important role in effective governance. Researchers have typically focused on identifying observable positive outcomes of effective monitoring (e.g., (Ajinkya, Bhojraj and Sengupta (2005)), (Chen, Harford and Li (2007)), (Denis and Serrano (1996)), (Hill and Snell (1989)), and Shivdasani (1993)). With respect to CEO compensation, it is generally perceived that a positive association between monitoring and the CEO's wealth-to-performance sensitivity (WPS) suggests effective monitoring (see, for example, (Hartzell and Starks (2003))). However, if monitoring substitutes for incentive pay as implied by traditional contract theory, monitoring can still affect CEO pay even though no positive relation is observed between them. If the substitution effect exists, the relation between effective monitoring and increases in WPS is then not a reliable relation to test the effectiveness of monitoring. This paper investigates the impact of monitoring on the CEO's WPS and how boards manage the CEO's contractual incentive pay.

Starting with the work of (Berle and Means (1932)), agency problems have been raised as an issue for modern corporations. Two mechanisms are suggested to align the interests between managers and shareholders. One of them is to provide CEOs with incentive pay so that they will act in shareholders' interests. The other one is to monitor CEOs to execute efforts and to take the right actions. If we believe that firms are in equilibrium and the structures of CEO compensation are chosen endogenously, monitoring and incentive pay are not necessarily complementary to each other. In other words, monitoring can substitute for incentive pay if the marginal cost of monitoring per extra unit of CEO effort induced is lower than the marginal cost of providing incentive pay.

By standard contract theory, monitoring reduces the required contractual incentive pay ((Holmstrom (1979))). In absence of additional information provided by monitoring, a CEO's contract is written completely on observable outcomes, typically stock returns. However, if additional valuable information is available to evaluate a CEO, her contract is thus written only partly on stock returns. The more valuable information monitoring provides, the smaller contractual incentive pay is required.

I use the total delta of a CEO's portfolio (including current and existing shares and options) scaled by the firm market value to measure the contractual incentive pay as the ex-ante WPS. This measure is appropriate because the firm's future stock returns not only affect its CEO's current pay but also the value of her existing stock and options holding. It thus captures the total incentives facing the CEO.

I consider monitoring by two channels – shareholder monitoring and board monitoring. I use long-term block institutional holdings (LT Top5) to capture shareholder monitoring. (Chen, Harford and Li (2007)) find that firms are more likely to withdraw bad bids with the presence of LT Top5 blockholders, suggesting that they are effective monitors. A large body of literature has documented the effectiveness of institutional monitoring (see, for example, (Carleton, Nelson and Weisbach (1998)), (Ajinkya, Bhojraj and Sengupta (2005)), and (Amihud and Lev (1981))). I have two measures for board monitoring. First, I use a dummy variable for board strength. It is equal to one if a CEO's tenure is shorter than the median tenure of all the board members, and zero otherwise. The measure is recalculated each year. In the context of CEO compensation, (Hermalin and Weisbach (1998)) show that a measure based on CEO tenure is a robust proxy for the overall strength of the board relative to the CEO. The first measure is the main measure for board monitoring in this paper. Second, I use the ratio of independent directors as alternative measure

for board monitoring. It is recalculated each year. Firms with higher proportion of independent directors tend to make better—or at least different—decisions concerning executive compensation, *ceteris paribus* ((Harford, Mansi and Maxwell (2008))). This measure has often been used in previous research to capture board monitoring, though arguably. I use the ratios as an alternative measure and to test the robustness of the first measure.

I find evidence that supports the substitutes view. First, I find that firms with strong monitoring use less total contractual incentive pay (ex-ante WPS) in almost all the industries.[1] After controlling for more factors, the regression analysis suggests a negative association between monitoring and total contractual incentives. Second, I do not find a positive relation between monitoring and the realized sensitivity of a CEO's wealth to shareholders' wealth (ex-post WPS), due to a substitution effect. The ex-post WPS is the ratio of realized pay to realized shareholders' wealth. If monitoring and incentive pay are substitutes, different combinations of the two mechanisms will lead to the same effort level and actions, and thus the same compensation for the effort and the same shareholder' wealth created. As a result, no relation between monitoring and ex-post WPS is expected.

The findings are in contrast to the traditional complements view, usually assumed in prior empirical corporate governance research. The complements view has two implications: first, strong monitoring increases the use of incentive pay. Second, as a result, firms with strong monitoring have higher realized wealth-to-performance sensitivities. Prior research usually focuses on the relation between monitoring and the realized sensitivity to test monitoring effectiveness in terms of CEO compensation. However, this relation is not reliable, due to the

[1] Utilities and financial industries are excluded from my sample.

substitution effect of monitoring and contractual incentives. Testing based on this relation could possibly lead to incorrect conclusions.

I then investigate how boards manage contractual incentive pay. I find that firms use the structure of equity-based compensation, specifically, the split between restricted stock and options, rather than use salary or bonus, to manage total contractual incentives. A dollar of stock provides less incentive than a dollar of options. The relative use of restricted stock influences the total delta of the CEO's portfolio and thus the ex-ante WPS. I have two findings. First, better monitored firms tend to use more restricted stock. Second, a higher ratio of restricted stock to the total equity-based compensation is negatively associated with total ex-ante WPS. After controlling for the effect of LT Top5 monitoring on the equity-based pay structure, the direct impact of LT Top5 on the ex-ante WPS disappears. This suggests that the negative association between monitoring and ex-ante WPS comes through the direct effect of monitoring on the structure of equity-based compensation. The results for board monitoring are similar, but some residual effect of board monitoring on WPS remains even after controlling for board monitoring's effect on the compensation structure.

There is relatively little prior research examining the structure of equity-based compensation in detail. Two reasons contribute to this fact. First, the use of options dominates restricted stock in the 1990s and early 2000s: about 70% of ExecuComp firms used only options as the sole equity-based compensation component for CEOs. Second, before 2005 accounting standards favored option grants by not requiring the expensing of at-the-money or out-of-the-money options. This favorable accounting treatment distorted firms' incentives in choosing compensation structures because the option grants can be potentially used to manipulate accounting earnings. I use data after standards changed to reflect the value of options granted to

avoid the possible accounting-based distortion in choosing the structure of equity-based compensation.

Finally, I investigate the effect of the structure of equity-based compensation on CEO total pay levels. Risk-averse CEOs require a lower dollar value of stock grant than options grant because options are riskier. Firms that use more restricted stock can lower the total pay level of the CEO. Consistent with this idea, I find a negative association between restricted stock use and CEO total pay level.

The paper makes two contributions. First, it shows that monitoring and incentive pay interact as a system in aligning the interests of managers and shareholders. Increasing the use of one mechanism decreases the other. The substitution effect makes the research on the relation of monitoring and CEO compensation more complex. A low WPS does not necessarily suggest inefficient monitoring or weak governance. Second, it shows that the structure of how boards provide equity-based compensation matters. Changing the compensation structure changes the CEO's ex-ante wealth-to-performance sensitivity and the total pay level.

The remainder of the paper is organized as follows. Section II develops hypotheses to test whether monitoring is a substitute for incentive pay and whether firms use the structure of equity-based compensation to manage ex-ante WPS. Section III explains the source of data and introduces the measures of monitoring, incentive pay, the structure of equity-based compensation and other variables. Section IV introduces the models used for testing the hypotheses. Results and discussions follow each test. In Section V, I discuss and criticize the relation to test monitoring effectiveness on CEO compensation in prior research. Section VI concludes this paper.

II Hypotheses Development

II.1 Monitoring and Incentive Pay

I assume that managers are self-interested. If they do not own 100% of the firm, they tend to destroy firm value compared to identical firms that are solely owned by managers (see, (Berle and Means (1932)), (Jensen and Meckling (1976)) etc.). Aligning interests of managers and shareholders is a way to reduce the agency problem. A common measure for the degree of interest alignment is the wealth-to-performance sensitivity (WPS), usually defined as the dollar change of the manager's wealth due to $1000 increase in the shareholders wealth (see, e.g. (Jensen and Murphy (1990))). The measures for incentive pay are discussed in Section III.2 in more details. In order to link managers' wealth to shareholders wealth, firms use incentive pay mainly in the form of equity-based compensation. Equity-based compensation has the feature that its value will change due to the change in stock prices (shareholders wealth).

There are two competing views on the relation between monitoring and incentive pay: the complements view and the substitutes view. The complements view believes that effective monitors align interests better and therefore increase the WPS. (Hartzell and Starks (2003)) use institutional concentration as a measure for institutional monitoring. They find that influential institutions increase the pay-for-performance sensitivities of options. However, (Smith and Swan (2007)) find that the relation disappears if they use other measures for firm size that they believe are more appropriate. Another implication of the complements view is that effective monitors act as a check on pay levels. Monitoring reduces the total pay level because it reduces rent extraction by the manager in the form of greater compensation. (Core, Holthausen and Larcker (1999)) find that CEOs in firms with more effective governance structures earn lower compensation.

The complements view has an implicit assumption that managers have been provided with the wrong level of incentives ex-ante. Effective monitors correct this and provide managers with higher levels of contractual incentive pay to align interests more tightly. The complements view implies that, with the presence of effective monitors, we should observe a higher contractual incentive pay.

H1a (complements view): A better monitored firm uses higher total contractual incentive pay.

H2: A better monitored firm has a lower total pay level.

The other view is the substitutes view. In contrast to the complements view, it is based on the assumption that managers are generally provided with the right level of incentives ex ante. The optimal level of incentive pay is not necessarily the highest level.

Firms face the tradeoff between inducing the manager to take the right actions while not exposing her to too much risk ((Aggarwal (2008))). Aligning the manager's wealth more closely to the stock returns increases her exposure to risk that is beyond her control. Managers are assumed to be risk averse because they hold portfolios that are not well diversified. They also cannot hedge their portfolios efficiently because they are not able to hedge them continuously and they are not allowed to hold short positions of their firms' stocks. Risk-averse managers require higher compensation for bearing the risks. Firms, therefore, must pay their mangers more for exposing them to higher risks.

The tradeoff implies that, in general, it will not be optimal for the manager to have no equity stake or a full 100% equity stake in the firm. (Holmstrom and Milgrom (1987)) derive the optimal WPS as:

$$\alpha^{*} = \frac{1}{1 + rk\sigma^{2}}$$

where α is the WPS, r is the coefficient for absolute risk aversion of the manager, k is the curvature of the agent's disutility of effort function, and σ^2 is the variance of the performance measure (frequently, stock price performance).

In addition, using incentive pay has side effects that reduce firm value. First, it is contracted on observable but noisy outcomes. CEOs must be compensated for their exposure to firm risks. Second, payments based on the observable outcomes can distort incentives ((Holmstrom and Milgrom (1991)), (Baker (1992))) such as by encouraging investment decisions that increase short-run profits at the expense of long-run profitability ((Dechow and Sloan (1991)), (Gibbons and Murphy (1992))).

(Holmstrom (1979)) argues that even imperfect information from monitoring can benefit the principal. Under standard contract theory, the optimal sharing proportion decreases as monitoring increases. In the extreme case, a manager is optimally paid by a flat rate under perfect information, where the first-best solution is achieved. If managers can be effectively monitored, firms can rely less on incentive pay. The substitutes view implies that the contractual incentive pay decreases in the monitoring. (Cadman, Klasa and Matsunaga (2010)) compare a dataset of ExecuComp and Non-ExecuComp firms for 2000-2004. They find institutional concentration is negatively related to incentives in both samples.

If two wage schemes—one with high contractual incentive pay in a worse monitored firm and the other one with low contractual incentive pay but in a better monitored firm—induce the same actions and efforts made by managers, then the compensation for the effort is the same. However, the compensation for the risk exposure is lower for better monitored managers because they have smaller components of variable wages. The total pay level is thus lower on average for better monitored managers.

H1b (substitutes view): A better monitored firm uses lower total contractual incentive pay.

H2: A better monitored firm has a lower total pay level.

II.2 Monitoring and the Structure of Equity-Based Compensation

The WPSs are driven primarily by stock options and stock ownership, and not through other forms of compensation ((Murphy (1999))). To manage the total contractual incentives, a firm must determine the proportion of equity pay used and the structure of equity-based compensation. Since 1993, a firm can fully deduct non-performance-based cash compensation up to $1 million. This decreases the benefits from using cash past $1 million. (Murphy (1999)) states in his survey that salaries for CEOs are typically set to match competitors, based on general industry salary surveys adjusted for size except for utilities and financial institutions.[2]

Given the proportion of equity-based compensation to total compensation, firms use the proportion of restricted stock in total equity-based compensation to manage contractual incentive pay. One dollar of options provides greater incentive than $1 of stock when options are in the money (e.g., (Hall and Murphy (2000))). For the same dollar amount of equity-based pay, a higher proportion of restricted stock decreases the total contractual incentive pay. Under the complements view, better monitored firms want to increase the total contractual incentives to align the interests of managers and shareholders better. Effective monitors tend to use a higher (lower) proportion of option grants (restricted stock) for the same amount of equity pay. In contrast, the substitutes view

[2] My sample excludes firms in the utilities and financial industries.

implies that managers who are better monitored will be granted a higher proportion of restricted stock to have lower contractual incentive pay.

H3a (complements view): A better monitored firm uses a lower proportion of restricted stock in total equity-based compensation.

H3b (substitutes view): A better monitored firm uses a higher proportion of restricted stock in the total equity-based compensation.

Table I lists the main hypotheses for the two competing views.

[Insert Table I]

There are other differences between restricted stock and options. These are discussed in Appendix 1. The use of restricted stock will have an impact on the total pay level due to the curvature of managers' utility functions. One dollar of options is worth less to a risk-averse CEO than $1 of stock, rendering them more expensive to the firm (e.g., (Oyer and Schaefer (2005))). For a given amount of equity pay, the compensation package with more restricted stock reduces the CEO's exposure to the firm risk and thus reduces the level of other payments necessary to the CEO to keep her total utility the same. In other words, given the same dollar amount of other payments, such as cash and bonus, a firm can reduce the total dollar amount of equity pay while keeping the CEO's utility the same. In either case, the total pay level decreases with more restricted stock use.

H4: A firm that uses more restricted stock has a lower CEO total pay level.

A firm can also use a portfolio of cash and options to manage the contractual incentive pay.[3] If it does so, a relation between cash use and monitoring will be observed. In Section IV.4.c, I will test whether firms use cash to manage the overall ex-ante WPS provided to managers. If this is not the case, then the structure of equity-based compensation will be the main determinant for the ex-ante WPS (contractual incentive pays).

III Data and Measures

The CEOs' annual compensation data is from ExecuComp. The sample covers fiscal year 2005 through fiscal year 2009. I choose the sample period post 2005 because the SEC adopted FAS 123 effective the start of a public company's fiscal year after June 15th 2005. Post 2005, firms are required to expense option grants at their fair value when they are granted. By explicitly recognizing the cost of options, the change in accounting standards treats options and stocks similarly, providing firms with more flexibility in choosing the structure of CEO equity-based compensation. I choose to start the sample after the standard change to avoid the potential bias in choosing the stock options driven by other concerns such as earnings management.[4] In Appendix 1, I discuss in more detail the effect of adopting the FAS 123 on the potential choice of restricted stock and options.

Institutional investors' information is from Form 13F disclosures via Thomson Reuters. Firm financial information is from Compustat. Board information is from RiskMetrics. Analyst forecast information is from I/B/E/S. I require that the sample firms have observations in both

[3] The portfolio of cash and options cannot completely replicate restricted stock. Details are discussed in Appendix 1.
[4] Please note that the accounting rules set by FASB are separate from taxation rules set by IRS. FAS 123 does not have any impact on the tax implications of restricted stock or options.

Compustat and ExecuComp. Firms in the financial service industries or utilities industries are excluded, because they tend to have different compensation structures ((Murphy (1999))).

III.1 Measures of Monitoring

I consider monitoring along two dimensions: institutional monitoring and board monitoring.

III.1.a Institutional Monitoring

The free riding problem interferes with monitoring by shareholders. Block shareholders, such as institutional investors, reduce the collective action problems faced by shareholders. They have the incentive to monitor the firm if the benefits they capture from monitoring are higher than the costs.

The benefits of block institutional investors are larger in the size of their investment in the firm for two reasons. First, a block shareholder captures a large proportion of the benefits. Second, a block shareholder has a larger share of the vote, and therefore has a greater influence on the voting outcomes. (Shleifer and Vishny (1986)) find that such voting influence puts pressure on the management. (Gillan and Starks (2003)) also show that proposals sponsored by institutional investors gain more support.

The average cost of monitoring is low for large institutional investors for four reasons. First, there are fixed costs of monitoring, including information gathering and effort to influence management. The average cost is then smaller, the larger is the size of the holdings. Second, a shareholder who offers the same proposal at a number of companies can reduce her per-company solicitation cost, while preserving the per-company benefit from success. Similarly, a shareholder who votes on the same proposal many times has reason to invest more time and attention in casting an informed vote. Third, institutional investors usually have a group of expert analysts on staff.

They are better and more efficient at processing information. Fourth, larger holdings can reduce the total cost of monitoring by giving the institutions easier access to information ((Chen, Harford and Li (2007)) and (Carleton, Nelson and Weisbach (1998))).

Long-term independent institutions with concentrated holdings are more likely to monitor since they have lower costs and larger benefits. I use the ownership controlled by the five largest institutional investors (Top5) as the measure for concentrated institutional holdings. This measure is often used in the institutional holdings literature related to monitoring (for example (Chen, Harford and Li (2007)) and (Hartzell and Starks (2003))).

The type of institutional investor also matters in monitoring. Many institutional money managers face conflicts of interest. For example, banks and insurers have strong conflicts because of their extensive business dealings with corporate managers. To vote against the managers will likely lead to loss of business for such institutional investors, and as such, they are unlikely to play an effective monitoring role. Additionally, institutional investors who hold shares for trading purposes are not expected to exert effort in monitoring the firms. (Chen, Harford and Li (2007)) use acquisition decisions to reveal monitoring and they find that independent institutions with long-term investments will specialize in monitoring and influencing effort rather than in trading.

(Bushee (2001)) and (Bushee and Noe (2000)) categorize institutions into three groups: transient, quasi-indexer and dedicated—based on their past investment patterns in the areas of turnover and diversification. Transient investors hold shares for trading purposes and are not expected to exert effort in monitoring the firms. Dedicated investors hold large average investments in the firms and have extremely low turnover. They are likely to play the monitoring role of gathering information and attempting to influence managers. Quasi-indexers also hold large stakes with low turnover, but their portfolios are diversified. Their monitoring functions are

uncertain. If an institutional investor invests in the firm both the year (t) and prior (t-1), and is classified as 'Dedicated' or 'Quasi-Indexer', it is a long-term investor (LT).

Following (Chen, Harford and Li (2007)),[5] I use the ownership of all the long-term institutions with concentrated holdings (LT Top5) as the reported measure for institutional monitoring. To be qualified as an LT Top5 blockholder, it must be in the top five largest institutions in the firm, regardless of institutional types, for both the year and the year prior. Then I overlap it with 'Dedicated' or 'Quasi-Indexer' institutions for both years, as per Bushee's categories. Updated institutional investor classification data is obtained through Bushee's website.[6]

For example, the largest five institutional investors in the firm in year t are A, B, C, D, and E. A, B, and C are 'Dedicated' or 'Quasi-Indexer'; D and E are 'Transient'. In year t-1, the largest five institutional investors in the firm are A, B, F, G, and H. A, B, and F are 'Dedicated' or 'Quasi-Indexer'; G, and H are 'Transient'. Then LT Top5 in year t is the total ownership of A and B in year t.

Alternative proxies for institutional monitoring are the sum of the five largest LT holdings, and the sum of all the LT block holdings, among all LT investors that hold more than 5% of the total shares outstanding.

Prior research shows that institutional investors are good monitors and positively impact the firm through improving the accuracy in financial reporting (e.g., (Ajinkya, Bhojraj and Sengupta (2005))), increasing firm value (e.g., (Bushee (2001)), (Thomsen and Pedersen

[5] Unlike Chen, Harford and Li (2007), I do not overlap the LT Top5 institutional investors with CDA/Spectrum's types. The CDA/Spectrum's type classification is not accurate beyond 1998. Chen, Harford and Li (2007) carry the classification in 1998 forward to years afterwards. My sample period is 2005-2009, which is almost a decade later. The classification in 1998 is unlikely to be accurate.

[6] http://acct3.wharton.upenn.edu/faculty/bushee/IIclass.html

(2000))), increasing productivity (e.g., (Hill and Snell (1989))), influencing corporate strategies (e.g., (Amihud and Lev (1981)), (Chen, Harford and Li (2007))) and impacting executive compensation (e.g., (Hartzell and Starks (2003))). In addition, large institutional investors can improve the board of directors by placing institutional representatives on the board.

III.1.b Measures of Board Monitoring

(Harford and Li (2007)) argue that the corporate governance literature does not suggest a widely accepted measure for general board strength since specific measures are relevant to different firm behaviors. In the context of CEO compensation, (Hermalin and Weisbach (1998)) show that a measure based on CEO tenure is a robust proxy for the overall strength of the board. They show that the board has been chosen through a process partially controlled by the CEO. A CEO has more bargaining power if she stays in the firm longer than the board directors. I use an indicator for board strength that is set equal to one if the CEO's tenure is shorter than the median tenure of the board directors, and zero otherwise. This indicator is recalculated annually.

The data availability of board information will consequently reduce the sample size. In order not to further reduce the number of observations, I fill the missing values for board strength as follows:[7] I replace the dummy variable with a value of one if the CEO has below ExecuComp median years serving as the CEO, and a value of zero otherwise ((Harford and Li (2007))). It is recalculated each year. [8]

The alternative measure for board monitoring is the ratio of independent directors. I use the classification of directors by RiskMetrics. An independent director in this paper is an

[7] I also apply the measure of board strength by Harford and Li (2007) to the entire sample. The results remain the same.
[8] As a robust check, I reexamine all the tests using the reduced sample. Results are the same.

independent outside director, who has no material connection to the company other than a board seat.[9] Prior research shows that board characteristics do appear to be related to board actions ((Harford, Mansi and Maxwell (2008))). Firms with a higher ratio of independent directors tend to make better—or at least different—decisions. For example, (Weisbach (1988)) finds that CEO turnover is more sensitive to performance if the board is outsider dominated.

Due to data availability of board composition, using the second measure (ratio of independent directors) reduces my sample by almost half. I use the second measure mainly for a robustness check, and results do not change.

III.1.c Measures of Monitoring Costs

Monitoring costs may differ across industries and firms. LT Top5 investors execute monitoring only if the benefits are larger than the costs. A more transparent firm is easier to monitor and the costs of monitoring are lower. I use industry dummies to control for the variation of firm transparency across industries. Industry is defined by Fama-French 30-industry classification. I further control for the analyst coverage and standard deviation of analyst forecasts as the measure of monitoring costs. Lower cost of monitoring attracts analysts to follow firms because it is easier to access and process their information. In addition, analysts are more likely to have similar forecasts for a transparent firm. In contrast, a nontransparent firm will deter analyst following. Even if the nontransparent firms are followed, analysts tend to have more dispersed forecasts.

[9] A more detailed definition of independent outside directors can be found at http://wrds-web.wharton.upenn.edu/wrds/support/Data/_001Manuals%20and%20Overviews/_115RiskMetrics/RiskMetrics%20Directors%20Definitions.cfm

I use log(1 + average number of analysts) as the measure of analyst coverage. For each year, I collect the total number of analysts who forecast EPS for the firm 1 to 5 years forward. Then, I take the average of the numbers for the prior 3 years. Since analyst coverage is highly skewed, I transform the measure by taking the log.

I use the standard deviation of analyst forecast scaled by average forecast value as the measure of analyst forecast dispersion. I first scale the standard deviation by average forecast value for each year and each forecast period from 1 year to 5 years forward. Then, I take the average of all the scaled standard deviations for each year. Lastly, I calculate the mean of the year averages over the prior three years (from year t-1 to t-3).

III.2 Measures of Incentive Pay

The empirical literature uses a variety of measures for incentive pay. These basically fall into two broad groups: pay-for-performance sensitivities (PPS) and wealth-to-performance sensitivities (WPS).

(Murphy (1985)), (Gibbons and Murphy (1992)) and (Rosen (1992)) use percent-to-percent sensitivity b^I, which is the percentage change in a CEO's expected pay due to the percentage change in a firm's value. (Demsetz and Lehn (1985)), (Jensen and Murphy (1990)), (Yermack (1995)), and (Schaefer (1998)), use dollar-to-dollar sensitivity b^{II}. This is the dollar change in CEO pay due to the dollar change in firm value. (Holmstrom (1992)) and (Healy (1985)) use dollar-to-percent sensitivity b^{III}. This is the dollar change in CEO pay due to the percentage change in firm value.

$$b^I = \frac{\Delta \ln(Pay)}{\Delta \ln(Firm\ Value)}$$

$$b^{II} = \frac{\Delta \$Pay}{\Delta \$Firm\ Value}$$

$$b^{III} = \frac{\Delta\$Pay}{\Delta\ln(Firm\ Value)}$$

However, the pay-for-performance sensitivity is not a good measure for a CEO's incentive since she is likely to hold options and shares granted in previous years that are not exercised or sold. The current firm performance will also affect her existing portfolio. Thus, a wealth-to-performance sensitivity is a better measure of a CEO's incentive.

Similar to pay-for-performance sensitivities, we can construct three types of wealth-to-performance sensitivities.

$$B^{I} = \frac{\Delta\ln(Wealth)}{\Delta\ln(Firm\ Value)}$$

$$B^{II} = \frac{\Delta\$Wealth}{\Delta\$Firm\ Value}$$

$$B^{III} = \frac{\Delta\$Wealth}{\Delta\ln(Firm\ Value)}$$

B^{I} is developed and used by (Edmans, Gabaix and Landier (2009)). This measure is the elasticity of CEO wealth to performance. It is independent of firm size and is an appropriate measure for incentives when the effort choice of the CEO has a multiplicative effect on both CEO utility and firm value ((Edmans, Gabaix and Landier (2009))). B^{II} is used by (Jensen and Murphy (1990)). This is a dollar-to-dollar measure and is a better measure for incentives for activities whose dollar impact is the same regardless of firm sizes, such as overpaying for an acquisition ((Dechow, Sloan and Sweeney (1996))). B^{III} is the value of 'equity-at-stake' ((Frydman and Jenter (2010))) and is reported by (Healy (1985)). It is the dollar change in wealth for a percentage change in firm size, which is an appropriate measure for the incentives for actions whose effect scales with firm size, such as a corporate reorganization.

Following most of the previous literature, I use dollar-to-dollar sensitivity, specifically, B^{II} as the incentive measure, because it catches the total wealth change including the granted compensation in the year and the value change of her existing portfolio due to the stock price change.

The contractual incentive pay provides a CEO with the incentive to make the right decisions in the future rather than rewarding her for past performance. Following (Edmans, Gabaix and Landier (2009)), I define the ex-ante WPS as the measure for contractual incentive pay.

$$WPS^{ex-ante} = \frac{Total\ Delta * Stock\ Price}{Aggregate\ Value}$$

Total delta[10] is the delta of a CEO's existing portfolio including the shares and options she receives in the year and in earlier years. The aggregate value of the firm is the market value of the firm.[11]

The ex-post WPS is the realized wealth-to-performance sensitivity. The realized WPS (ex-post WPS) or PPS is usually the sensitivity that researchers use to measure the degree of interests alignment. The realized WPS is defined as:

$$WPS^{ex-post} = \frac{\Delta\$Wealth}{\Delta(Firm\ Value)}$$

where $\Delta\$Wealth = RET_t * Stock\ Holding_{t-1} + \Delta\$Option\ Holding_{t-1} + Total\ Pay_t$. RET_t is the buy-and-hold return from year t-1 to t; $\Delta\$Option\ Holding_{t-1}$ is the total option value change due to the firm's stock price change from year t-1 to t; $\Delta(Firm\ Value) = RET_t * MV_{t-1}$.

[10] See Edmans, Gabaix and Landier (2009)'s Appendix B for detailed calculation of deltas.
[11] Market value of a firm = total assets (Compustat item AT) – book value of equity (Compustat item CEQ) + market value of equity (Compustat item MKVALS)

I do not use the direct change of market capitalization ($MV_t - MV_{t-1}$) from year t-1 to t to avoid possible bias by new equity issues or stock repurchases.

III.3 Measures of the Structure of CEO Equity-based Compensation and Total CEO Pay Levels

Option values are calculated using the dividend-adjusted Black-Scholes Model. Prior to 2006, ExecuComp data of previously granted options are not detailed enough to calculate the exact value. I estimate the option value using the method introduced by (Core and Guay (2002)). Detailed information of all the options held by a CEO during the years 2006 to 2009 is disclosed and can be retrieved from ExecuComp. Therefore, all the options held by a CEO, including the previously awarded ones, can be estimated.

I calculate the ratio of restricted stock awards to the equity-based compensation as

$$\frac{ValueofRestrictedStock}{(ValueofRestrictedStock + ValueofOptions)}$$

When I calculate the Black-Scholes values for options, I discount the grant term by 30% because executives rarely wait until the expiration date to exercise their options. Using the full grant term will overestimate the option value. The value of the restricted stock is the market value at the grant date (ExecuComp item RSTKGRNT for fiscal year 2005 and STOCK_AWARDS_FV for fiscal year 2006-2009). Both the value of restricted stock and the options are the total value granted during the fiscal year. Total compensation[12] is the sum of salary, bonus, other annual, total

[12] Total compensation = ExecuComp item TDC2- ExecuComp item OPT_EXER_VAL + Black-Scholes Value of options granted

value of restricted stock granted, total value of stock options granted (using Black-Scholes), long-term incentive payouts, and all other compensation.

III.4 Other Variables

Measures for other firm characteristics are used throughout this paper: firm size; firm profitability; firm risk; firm growth opportunities; dividend yield; and leverage.

Measures for the firm size are: log of market capitalization, log of total assets and log of total sales. For presentation purposes, I only report the results using log of market capitalization as the control for firm size. Other measures are used for robustness tests and do not change the results.

I use two measures for firm profitability: returns on total assets (ROA) and annual buy-and-hold returns on stock (RET). ROA is the ratio of earnings before interest and tax (Compustat item EBIT) to the book value of total assets (Compustat item AT) at year end.

I use two measures for the firm risk: standard deviation of ROA and standard deviation of RET. Following (Core, Holthausen and Larcker (1999)), I use the annual standard deviation of ROA over the prior five years. Standard deviation of RET is calculated using monthly stock return data over the prior five years.

Firm growth opportunities are measured by the firm's year-end market-to-book ratio averaged over the previous five years, following (Core, Holthausen and Larcker (1999)). Dividend yield is the average dividend yield (defined as the ex-date dividend per share (Compustat item DVPSX_F) divided by the fiscal year end share price (Compustat item PRCC_F)) of the last three years (from year t-1 to year t-3). Leverage is the book leverage, defined as sum of long-term debt (Compustat item DLTT) and debt in current liabilities (Compustat item DLC) over the book value

of assets (Compustat item AT). Appendix 2 summarizes the definitions of all the main variables used.

IV Methodology and Results

IV.1 Summary Statistics

There are four main forms of compensation for a typical CEO: cash, restricted stock grants, option grants, and others. Figure I, Graph A shows the evolution of CEO compensation. The height of the bar each year is the median total CEO pay of all the ExecuComp firms. All values are in 1992 constant dollars. For each year, I calculate the median percentage for each component across all ExecuComp CEOs. The value of each component is then the product of the median total pay and the median percentage. For example, in 2005, the median value of total CEO pay is $1,814,309 in constant 1992 dollars. The median proportion of the cash component in the total CEO pay in year 2005 is 53.11% and the median proportion of the equity component is 34.17%. The rest (12.72%) is classified as 'other'. Within the equity component, the median percentage for restricted stock is 38.30%. The value of restricted stock in year 2005 is then $237,441 (=1,814,309*34.17%*38.30%).

Cash pay is the largest component of CEO pay in early years but decreases to around half of the total pay in the early 2000s due to the increasing use of stock options. After 2005, restricted stock has become a significant component: it is 13% (year median) of total CEO pay in 2005, and goes up to 29% in 2009. Table I Panel A illustrates the evolution of CEO compensation from 1992 to 2009. The median cash pay to an ExecuComp firm CEO is around 1 million in nominal value (see Table II Panel A column (1)), which is the limit a firm can fully deduct non-performance-based cash compensation since 1993. However, the proportion of cash compensation becomes

smaller due to the increase in total compensation and the use of equity based compensation (see Table II Panel A column (5) and (3), see also Figure I Graph A). The proportion of ExecuComp firms that grant restricted stock to their CEOs is increasing over time (see Table II Panel B and Figure I Graph B): less than 1/4 of the ExecuComp firms grant CEOs restricted stock before 2001, but the number steadily goes up over the subsequent years. After 2005, more than half of the firms award their CEOs restricted stock. In 2009, almost 70% of the ExecuComp firms—which is more than triple the number a decade before—include restricted stock in their CEO's compensation package.

[Insert Figure I]

[Insert Table II]

Two reasons contribute to the increasing use of restricted stock: the decline in the stock market and the advent in option expensing in 2005. First, options provide weaker incentive at the downside. The market decline makes the options more likely to be out of the money and inefficient at aligning interests between managers and shareholders.

Second, the adoption of FAS 123 in 2005 reduces the perceived constraint on the use of restricted stock. Prior to 2005, a firm could pay a CEO with options without reducing the firm's accounting profit measures such as ROA. The regulation change in 2005 requires firms to expense the option grants. Options are no longer 'free' for a firm. Consequently, I use the data after 2005 to investigate the equity structures. Table II, Panel B and Figure I, Graph B present the trend of using restricted stock and options. In 1992, 71% of the firms use options only as the equity-based

compensation; 11% of the firms use restricted stock only; and 18% of the firms use a mix. The proportion of firms using restricted stock increases steadily from 29% in 1992 to 69% in 2009.

Table III, Panel A shows the summary statistics for LT Top5 ownership. The median ownership of LT Top5 is around 25% for the years 2005 to 2009. I then divide the firms by board strength each year. More than half the firms have strong board in each year. The distributions of LT Top5 are not significantly different between the two subgroups and are stable across these years. More than three quarters of the sample firms have more than 17% equity owned by LT Top5 and a quarter of the firms have such ownership above 31%.

I also divide my sample into two groups, based on year median LT Top5 ownership. One group is the Compustat firms whose LT Top5 ownerships are above the year median. The other group is the Compustat firms whose LT Top5 ownerships are below the median. Table III Panel B summarizes the main firm characteristics. Firms with higher LT Top5 ownership tend to be smaller, less profitable, and paying out fewer dividends. I control for the firm characteristics in the tests in Section IV and the results are robust. Alternatively, I divide the sample by board strength (Table III Panel C). In general, firm characteristics are not significantly different between the two groups.

[Insert Table III]

IV.2 Monitoring and Contractual Incentive Pays

The complements view and the substitutes view have competing hypotheses for the relation between monitoring and contractual incentive pay. The complements view implies that effective monitors ensure ex-ante that gains in CEO wealth from incentive compensation will be linked to shareholder value creation. The substitutes view believes that monitoring and incentive pay are

substitutes. The use of incentive pay is endogenously determined by the firm characteristics and the monitoring environment. I execute two tests for hypotheses H1a and H1b.

First, I test the differences between firms with strong or weak monitoring. I divide my sample by board strength and industry. Industries are defined by Fama and French's 30-industry classification. Utilities and financial industries are excluded in the sample. The industry classification is used as an approximate control for the differences of monitoring environment across firms. Table IV presents the medians and means of ex-ante WPS for the two groups in each industry. Generally, firms with strong boards have significantly lower contractual incentive pay, than firms with weak boards. Table III, Panel A shows that the LT Top5 ownership is similar in firms with strong or weak boards. Therefore, we can use board strength as a rough measure for the overall monitoring. The results are consistent with substitutes view that monitoring can substitute for contractual incentive pay. The results suggest that a better monitored firm uses less incentive pay to motivate its CEO.

Tests for monitoring effectiveness in prior research rely on the implicit assumption that monitoring improves CEO compensation design by increasing incentive pay (complements view). According to the complements view, we should have observed opposite results. Firms with strong boards should have used more incentive pay and therefore we should have observed positive differences in most of the industries. However, the results in Table IV provide counter-evidence.

[Insert Table IV]

Second, I use regression analysis to investigate the marginal effects of monitoring on contractual incentive pay. I use the ex-ante WPS, LT Top5 ownership, and Board Strength (or Ratio of Independent Directors), all defined in Section III as the measures of contractual incentive

pay, institutional monitoring and board monitoring. Analyst coverage, the standard deviation of analyst forecasts and industry dummies, are used to control for the variation in monitoring costs across firms.

Theoretically, the optimal incentive pay is determined by 1) the marginal product of CEO effort; 2) the CEO's risk aversion; 3) the CEO's cost of effort; 4) the CEO's outside wealth; and 5) the noise-to-signal ratio. However, most of the parameters are not observable. Empirically, the predicted determinants of CEO incentives are inconclusive.

(Holmstrom and Milgrom (1987)) predict a negative relation between the pay-for-performance sensitivity and the variance of the returns. (Aggarwal and Samwick (1999)) find empirical evidence supporting their predictions. In contrast, (Core and Guay (2002)) find a positive correlation between stock-price variance and pay-for-performance sensitivity. Following prior research, I use the volatility of stock returns and the volatility of return on assets as measures for the noise-to-signal ratio.

Other determinants used in empirical studies are: firm size, growth opportunities, CEO's age, leverage, and year dummies. Firm size is likely to have a negative relation to the sensitivity due to a smaller managerial ownership in a larger firm. I report the results using the log of market capitalization as the proxy for firm size. The results are robust even if other proxies, such as log of total sales and log of total assets, are used.

Evidence on the relation between the incentive pay and the growth opportunities is mixed. (Smith and Watts (1992)) and (Gaver and Gaver (1995)) find a positive relation, while (Bizjak, Brickley and Coles (1993)) and (Yermack (1995)) report a negative correlation. I use the average market-to-book ratio over the prior five years as the proxy for growth opportunities, following (Core, Holthausen and Larcker (1999)).

(Gibbons and Murphy (1992)) argue that incentives should be strongest for CEOs close to retirement to substitute for declining career concerns. I use the CEO's age (reported) and the CEO's tenure (unreported) to measure her career concern.

I also control for debt levels. (John and John (1993)) predict a negative relation between executive incentives and the level of debt. However, (Yermack (1995)) does not find any empirical relation between them.

Missing data of standard deviation of analyst forecasts are recorded for firms followed by no analysts. The data availability further reduces the sample size. I run two regressions: one with the control for analyst related variables (Table V column (2)) and the other without (Table V column (1)).

Table V presents the results. All the errors are robust and clustered at firm level. After controlling for other potential determinants for the WPS, I find negative and significant coefficient estimates for LT Top5 ownership and board strength (or ratios of independent directors), supporting hypothesis H1b implied by the substitutes view and in contrast with hypothesis H1a implied by the complements view.

The average ex-ante WPS of my sample firms is $15.17. The average ex-ante WPS of the firms with a weak board is $26.64. Firms with strong boards reduce incentive pay by $14.56 per $1000 increase in shareholder wealth. Monitoring by influential institutional investors cannot be totally replaced by board monitoring. After controlling for board monitoring, LT Top5 ownership has an incremental impact on the incentive pay. A one standard deviation increase in LT Top5 reduces the ex-ante WPS by $2.17 (= 10.07*0.215), or by 14.9% (= 2.17/14.55) on average. The finding is consistent with the view that shareholder monitoring is effective and cannot wholly be substituted by other corporate governance mechanisms.

[Insert Table V]

IV.3 Monitoring and Restricted Stock Use

In this section, I examine whether firms use structures of equity-based compensation to manage the contractual incentives (ex-ante WPS). First, I regress the ratio of restricted stock awards to the total equity-based compensation on LT Top5 ownership and board strength. Then, I examine whether the ex-ante WPS is solely driven by the structure of equity-based compensation. Using the alternative measure of board monitoring, i.e. ratios of independent directors, does not change the results. For illustration purpose, only the results using board strength as the measure for board monitoring are reported.

IV.3.a The Impact of Monitoring on Restricted Stock Use

Prior research on determinants of the choice between stock and options is limited. (Cadenillas, Cvitanic and Zapatero (2004)) study the incentive effects of granting levered or unlevered stock to a risk-averse manager. Their numerical results suggest that options are optimal for managers in large firms. However, (Kadan and Swinkels (2008)) find that larger firms tend to compensate their managers with restricted stock. I use the log of market capitalization the prior year as the measure for firm size. There is no predicted sign of the coefficient.

(Kadan and Swinkels (2008)) study a principal-agent relation between risk neutral investors and a risk-averse and effort-averse manager. Their model predicts that stock grants are preferred by firms with larger bankruptcy risks. They also provide empirical evidence on the positive relation between bankruptcy risk and the use of stock. I use three measures for bankruptcy

risk: leverage, standard deviation of return on assets, and standard deviation of stock returns. The predicted signs of the coefficients are positive.

Dividend yield is a relative control for the use of stock grants to CEOs. Holding a stock option does not qualify the holder to receive dividends before exercising the option. The value of a call option declines when a stock goes ex-dividend. A CEO will prefer holding shares to options if the dividend yield is high. (Gillan and Starks (2003)) and (Ajinkya, Bhojraj and Sengupta (2005)) find a negative relation between management stock options and dividends. Therefore, I expect a positive sign of the coefficient for dividend yield.

Empirical studies have mixed evidence on the correlation between firm's growth opportunities and stock use. (Guay (1999)) argues that a growing firm has the greatest potential loss from underinvestment in valuable risk-increasing projects. He finds that firms with more growth opportunities have greater use of stock option plans—consistent with some other studies such as (Smith and Watts (1992)). Studies of other researchers do not agree with this relation. For example, (Gaver and Gaver (1993)) find that the incidence of restricted stock plans does not differ between growth and non-growth firms, after controlling for firm size. I use the five-year average of year-end market-to-book ratios as the measure for a firm's growth opportunities set. I also use R&D expenses scaled by total assets as another measure for investment opportunities. (Kole (1997)) finds that restricted stock use is more common in firms with higher R&D expenses. No signs of the coefficients for Investment Opportunities and R&D are predicted here.

I further control for the firm's profitability using the return on assets and the annual stock return in the prior year. The annual stock returns also controls for the change of incentives provided to the CEO in previous years due to the change in stock price. If a firm performs well in the stock market, deltas of the CEO's options will increase. The incentives provided by the existing options

will also increase. As a result, the firm will want to use more restricted stock to keep the incentives provided at the optimal level. I calculate the annual stock returns using the fiscal year-end stock prices. I do not use the buy-and-hold returns because the incentives provided by options only relate to the stock price changes. Finally, I control for the ratio of restricted stock in the existing portfolio. The existing ratio affects the CEO's ex-ante WPS. Boards are likely to adjust the granted ratio of restricted stock for given existing portfolio to keep the CEO's overall ex-ante WPS at the optimal level.

I estimate four models. Models (1)-(2) use OLS with robust standard errors clustered at firm level. Models (3)-(4) use Tobit regressions because the dependent variable is in the range between 0 and 100. I control for year and industries in all the regressions. I further control for the variation in the monitoring costs across firms in models (2) and (4).

Table VI, Panel A presents the results. All the regressions suggest a positive association between monitoring and restricted stock use. Using the mean values of other regressors and the coefficients in model (1), firms with a strong board grant 49.52% of the total equity grant value in restricted stock, 20.5% higher than the firms with a weak board (41.4%). After controlling for board strength, a one standard deviation of the LT Top5 ownership increases the restricted stock grant by 3.7% (from 46.16% to 47.88%, using mean values of other variables). Model (2) controls the variation of monitoring costs across firms. The impact of monitoring on the restricted stock use is slightly weaker but similar to model (1).

The Tobit regressions (columns (3)-(4)) suggest a more significant and larger impact of monitoring on restricted stock use. A one standard deviation increase in the LT Top5 ownership increases stock use by 7.3% (column (3)). Firms with strong boards use 34.6% more than firms with weak boards (column (3)).

[Insert Table VI]

IV.3.b Indirect Impact of Monitoring on Ex-Ante WPS

Next, I examine whether the decrease in WPS is solely due to the redesign in the compensation structure. I first get the predicted values of the ratios of restricted use from the regressions. Then, I regress the ex-ante WPS on the predicted ratios, LT Top5, Strong Board, and other controls. If the reduction in the ex-ante WPS is solely driven by the redesign of the equity-based compensation, we would see an insignificant coefficient on the LT Top5 and Strong Board.

Table VI, Panel B presents the results. The regression of ex-ante WPS against the stock ratio is presented in column (1). The higher ratio of restricted stock lowers the total ex-ante WPS. The predicted value from Table VI, Panel A column (1)-(4) is used as a regressor in the regressions presented by Table VI, Panel B column (2)-(5) respectively. The impact from LT Top5 is weakened after controlling for the predicted stock use. Compared to the results presented by Table V, the coefficients for LT Top5 are smaller in magnitude for all the regressions and are not significant at the 10% level for models (2) and (4), meaning that the influential institutions impact the ex-ante wealth-to-performance sensitivity mainly through the restructuring of the equity pay. The coefficients for Strong Board remain negative and significant at 1% level but are smaller in magnitude. After controlling for the structure of equity-based compensation, firms with strong boards still tend to use smaller contractual incentive pay due to direct monitoring by the board.

The results suggest that a better monitored firm tends to use more restricted stock, and how the board provides equity-based compensation matters. Changing the compensation structure changes the CEO's WPS. I do not find strong evidence that LT Top5 ownership has a direct impact

on the WPS after controlling for the structure of CEO equity-based compensation. The findings shed light on the negative relation between institutional investors and the CEO's WPS documented by previous research (see, for example, (Cadman, Klasa and Matsunaga (2010))).

IV.3.c Cash Payment

Salary payment is not related to a CEO's performance and is therefore almost risk free. A firm can reduce the compensation risk by increasing the use of cash while keeping the equity pay structure the same. Similarly, the same CEO can be indifferent to pay packages with different equity pay structures, if the total compensation risk across all is the same. In this section, I will show that this is not likely to be the driving force behind my results.

If firms use cash to manage ex-ante WPSs, we will observe a relation between monitoring and cash use. Table VII, Panel A shows the results for the regressions of the cash payment against LT Top5 ownership, board strength and other controls. Models (1)-(3) use salary as the dependent variable. Models (4)-(6) use the sum of salary and bonus as the dependent variable. Model (7) (model (8)) uses the salary (the sum of salary and bonus) scaled by total CEO compensation as the dependent variable. The results suggest that LT Top5 ownership does not change the cash payment. In comparing the results of models (1), (2) and (3), we find that including other determinants, in addition to firm size, industry dummies, and year dummies, does not help explain CEO cash payments significantly better. Firm size together with industry and year dummies alone explains 44% of the variation in CEO cash payments. Adding other firm characteristics controls only increases the R^2 to 48% from 44%. Models (3)-(6) illustrate similar results for the sum of salary and bonus.

Except for utilities and financial institutions, salaries for CEOs are typically set to match competitors, based on general industry salary surveys adjusted for size[13] ((Murphy (1999))). Salaries are not used by firms as a vehicle to adjust compensation risk. Bonuses are usually based on accounting performance and are not completely insensitive to performance. Nevertheless, I still examine the possible use of bonus to adjust CEO compensation risk. I do not find any evidence.

To further illustrate that the cash component does not change the results, I also include cash pay as an additional control. If the increase in restricted stock use is driven by the compensation structure change in the portfolio of cash and options, the cash payments will have a negative impact on the restricted stock use and monitoring should not have any impact after controlling for the cash payments. Table VII, Panel B shows the results. For illustrative purposes, I only report the results of model (2) in Table VI Panel A. The results are robust under each model.

After controlling for the cash payment, the LT Top5 and board strength remain significant and the magnitudes do not change. The results reported in Table VI are not driven by the change of cash use. Column (1) (column (2)) shows the results of using salary (the sum of salary and bonus) as the control for cash payments. The coefficient for the salary (the sum of salary and bonus) is positive and significant at 1%. It is in contrast with the prediction that firms increase restricted stock use due to less cash use. Column (3) (column (4)) illustrates the results from using the salary (the sum of salary and bonus) scaled by the total compensation. The coefficients for the LT Top5 and board strength are still positive and significant. Magnitudes of the coefficients are also very similar to the results reported in Table VI, Panel A, column (2). The coefficients on the ratios of cash pay are negative and significant. However, this does not mean that the cash payment affects the restricted stock use. As I illustrate in Table VII Panel A, the cash payment is mainly determined

[13] My sample excludes firms in the utilities and financial industries.

using the industry survey adjusted for firm size. When I scale the cash payment by the total pay, it captures the relation between total pay and restricted stock use. Even though the ratio of cash pay is related to restricted stock use, it does not reduce the explanatory power of LT Top5 and Strong Board for the restricted stock use.

[Insert Table VII]

IV.3.d Summary

Both the coefficients for LT Top5 and Strong Board have significant impacts on restricted stock use. The results suggest that firms adjust the structures of equity-based compensation to manage ex-ante WPSs. Better monitored firms tend to use more restricted stock. The variation in the equity-based pay structures is at least partly explained by the variation in the monitoring environment. LT Top5 investors, as influential shareholders, play a monitoring role that cannot be completely replaced by board monitoring. The results support hypothesis H3b implied by the substitutes view and is in contrast to hypothesis H3a implied by the complements view.

IV.4 Monitoring and CEO Pay Levels

Previous research suggests several economic factors to determine the optimal CEO compensation: firm size and complexity, the investment opportunities the firm faces, firm performance, and firm risk. Larger firms demand higher-quality managers with higher compensation ((Rosen (1982))). Firms with higher investment opportunities demand better managers and thus pay higher compensation to managers in equilibrium ((Core, Holthausen and Larcker (1999)) and (Smith and Watts (1992))). Standard agency theory indicates a higher level of pay for more effort. Since effort is unobservable, the outcomes of a CEO's effort—usually the

firm performance—is used to signal effort ((Holmstrom (1979))). Therefore, I expect positive relations between pay levels and firm performances. A typical CEO is risk-averse. Her portfolio is not well diversified, with a large proportion of investment in the firm she works for. A risk-averse CEO should be compensated for the risk she is bearing. A positive relation between the volatilities of the firm performances and the pay levels is predicted.

To be consistent with prior research, I follow (Core, Holthausen and Larcker (1999))'s economic model for CEOs' compensation level. I use total sales[14] to proxy for firm size and complexity, and the average year-end market-to-book ratios over the previous five years as the measure for investment opportunities. Firm performance is measured by return on assets and annual stock returns. Firm risk is estimated by the standard deviation of return on assets, and the standard deviation of monthly stock returns over the prior five years.

Table VIII, column (1) replicates the (Core, Holthausen and Larcker (1999)) model using my sample.[15] Consistent with them, I find a positive and significant coefficient for firm size, reflecting the demand of large firms for higher ability CEOs. However, unlike (Core, Holthausen and Larcker (1999)), I do not find any relation between CEO compensation and investment opportunities, proxied by market-to-book ratios. The difference could be due to sampling bias, or a bad proxy. The coefficient estimates for annual stock return and return on assets are positive and significant, which suggests that CEO compensation is positively associated with firm performance. The coefficient estimate for the standard deviation of stock returns is negative and significant. The coefficient estimate for the standard deviation of returns on asset is positive but not significant.

[14] To be consistent with Core, Holthausen and Larcker (1999), I use total sale. I also use market capitalization as a check for robustness. Results are similar.

[15] Core, Holthausen and Larcker (1999) use 14 indicator variables based on 2-digit SIC code to control for industry membership but I use Fama-French 30-industry classification to identify industry membership. In addition, they assume errors are independent while I adjust the errors to be robust and clustered at firm level.

The findings are consistent with (Core, Holthausen and Larcker (1999)), who report a negative relation between total CEO pay and the standard deviation of annual stock returns.

[Insert Table VIII]

The risk exposure of a risk-averse CEO not only depends on the firm risks, but also on her compensation sensitivity to the firm risks, that is, delta of her portfolio. Model (2) places additional controls on a CEO's compensation structure. Given the proportion of equity-based compensation, a larger proportion of restricted stock gives a lower portfolio delta. Conditional on firm risk, a lower sensitivity to firm risk requires less compensation on risk exposure. Column (2) in Table VIII reports the results.

Consistent with hypothesis H4, I find that there is a significant impact of equity-based compensation structures on total pay levels. Conditional on the ratio of equity-based compensation to the total pay, a higher proportion of restricted stock grant in equity-based compensation tends to decrease the total compensation level. The negative relation is likely due to a smaller exposure to firm risks.

Model (3) and (4) investigate the relation between monitoring and total CEO pay. Consistent with (Core, Holthausen and Larcker (1999)), I find a negative association.

In models (5) and (6), I control for both compensation structure and monitoring. After controlling for the compensation structure, the impact of monitoring on the CEO total pay level is smaller. For example, the coefficient for Strong Board becomes insignificant in model (6). The coefficient for LT Top5 still remains significant at 10% level under model (6), but the magnitude is smaller compared to it under model (4).

The results suggest that both the structure of CEO pay and monitoring have an impact the CEO's total pay level. Greater use of restricted stock reduces the total risk exposure of CEO and thus reduces the pay level required to compensate for bearing the risk. After controlling for the compensation structure, the impact from monitoring is weak. It suggests that the reduction in the total pay level is mainly due to the redesign of the compensation structure rather than a reduction in excess pay.

I also run all the regressions using log of total pay on log of sales. Results (unreported) are the same.

IV.5 Robustness Checks

Robust checks are performed for alternative measures. I use two other proxies to capture the institutional monitoring. One of the alternatives is to use the ownership of the five largest long-term institutional investors. The other is to use the ownership of all long-term institutional investors, each of whom holds at least 5% of the total market capitalization. Using either of these alternatives does not change the results.

I use alternative measures for board monitoring. First, I use the ratio of independent directors as the measure for boarding monitoring in all the tests. Results are similar. Second, I apply (Chen, Harford and Li (2007))'s measure of board strength to the entire sample. Board Strength equals one if the CEO's tenure is shorter than the median of all ExecuComp CEOs' tenure that year, and zero otherwise. The results are the same. Third, as another alternative, I exclude the firms with missing data on tenures of board members. I set the dummy Board Strength equal to one if the CEO's tenure is smaller than the median tenure of board members, and zero otherwise. It is recalculated each year. Results are the same if I use alternative measures.

I use two other proxies for firm sizes: log of total assets and log of total sales. Results remain the same.

I run all the regressions using contemporary values of the regressors. Results are even stronger. To be conservative and to reduce the possible endogeneity, I present the results using lag values for most of the control variables.

V Monitoring and the Realized WPS

Prior research usually uses the realized WPS to measure incentive pay or alignment of interests of managers and shareholders. The tests of monitoring effectiveness on CEO compensation relies on the relation that effective monitoring increases the realized WPS. The realized WPS is measured by the realized wealth change of the manager by \$1000 increase in the shareholders' wealth. Specifically, it is B^{II} in Section III.2.

$$B^{II} = \frac{\Delta\$Wealth}{\Delta\$Firm\ Value}$$

The complements view implies that, with the presence of effective monitors, a higher realized wealth-to-performance sensitivity (ex-post WPS) is observed as a result of the tighter interest alignment. However, the substitutes view does not predict a positive relation. Assume there are two wage schemes: one with high contractual incentive pay in a worse monitored firm and the other one with low contractual incentive pay but in a better monitored firm. Assume the two wage schemes induce the same actions and effort made by managers, and thus create the same shareholders' wealth as a result. The compensation for the efforts is the same because they induce the same efforts. Therefore, the ratios of the compensation to the change of the shareholders wealth are the same under the two wage schemes. The only difference may lie in the compensation for different exposures to risks under the two schemes. In Section IV.4, I show that monitoring

decreases the total pay levels due to the decrease in the use of contractual incentive pay. By the substitutes view, the compensation for effort is the same for a CEO in either better or worse monitored firms. However, the compensation for risk exposures is lower for the CEO working in a better monitored firm. The construction of the realized WPS indicates a non-positive relation between monitoring and the realized WPS, by substitutes view.

I investigate the relation between monitoring and the realized WPS in two ways. First, I regress the realized WPS defined in Section III.2 against measures of monitoring and other controls. If monitoring increases the realized WPS, we will observe a positive relation between the measures of monitoring and the realized WPS. Second, I use the traditional method to get the realized WPS that is used in most prior research. The regression for the second method is as follows:

$$\Delta Comp_{it} = \beta_1 + \beta_2 \Delta SW_{it} + \beta_3 LT\ Top5_{it-1} + \beta_4 Strong\ Board_{it-1}$$
$$+ \beta_5(\Delta SW_{it} * LT\ Top5_{it-1}) + \beta_6(\Delta SW_{it} * Strong\ Board_{it-1} + Controls + \varepsilon_{it}$$

The complements view (traditional view) predicts positive signs for β_5 and β_6.

Alternatively, I use the dummy variable Outsider-Dominated Board to measure board monitoring, to replace Strong Board. If more than half directors in a firm are independent as defined in Section III.1.b, the board is outsider-dominated. Otherwise, the value of the dummy variable is 0.

Table IX presents the results. Both measures of institutional monitoring (LT Top5) and board monitoring (Strong Board or % Independent Directors) have negative coefficients (see Table IX, Panel A), using the first methodology. The coefficients of LT Top5 are significant in Model (3) and (4). The coefficients of board monitoring have contradictory signs, but none is significant at 10% level.

The results for the second methodology are presented in Table IX, Panel B. Model (1) and (4) use the control variables that are used in the first methodology. β_5 is positive but insignificant at 5% level. The negative sign of β_6 in Model (1) suggests an increase in board monitoring decreases the realized WPS. However, if I use the Outsider-Dominated Board as the measure for board monitoring, the significance disappears. I then introduce CEO-firm fixed effects and year fixed effects in both model (2) and (5). LT Top5 does not have any impact on the WPS. Board monitoring still shows a negative sign for the interaction term. The coefficient for board monitoring is significant at 5% in Model (2) but insignificant at 10% in Model (5). Model (3) and (6) use firm fixed effects and year fixed effects. The results are similar to those of model (2) and (5).

[Insert Table IX]

Overall, the results are in contrast to the complements view that monitoring increases the realized WPS. Generally, monitoring has a weak negative impact on the realized WPS, due to substitution effect as shown in Section IV.2.

The results have an important suggestion. Using the relation of monitoring and the realized WPS to test monitoring effectiveness is not reliable. Failure to find a positive relation does not necessarily imply ineffective monitoring. On the contrary, it could imply effective monitoring, due to substitutes effect of monitoring and contractual incentive pay. Prior empirical corporate governance research ignores the possible substitution effect and relies on the relation implied by complements view. I do not see a good reason to eliminate substitutes view in empirical studies

without appropriate testing. The pre-set assumption of complements view may lead to wrong conclusions.

VI Conclusion

Two main mechanisms contribute to align the interests of managers and shareholders: incentive pay and monitoring. These two mechanisms can interact with each other as complements or substitutes. If a manager is believed to have been provided with the wrong level of incentives, monitoring helps to increase the use of incentive pay (complements view). However, monitoring helps principals to gain more information on the managers. Thus, less incentive pay is required because aside from observed outcomes, the additional information will be used to determine her pay (substitutes view). By testing the competing hypotheses, I show that monitoring is negatively associated with the contractual incentive pay used, which is in support of the substitutes view.

The substitution effect implies that the same amount of effort is induced by different combinations of monitoring and contractual incentive pay. Also, the same expected shareholder wealth will be created if a manager takes the same actions. If we measure the WPS using the ratio of the realized change of CEO compensation to the change of shareholders wealth, it is hard to find a relation between monitoring and WPS.

The substitution effect of monitoring makes it hard for researchers to investigate monitoring's impact on executive compensation. Monitoring can still be effective and influential on pay even when no increase of WPS is observed. The results in this paper suggest caution in drawing conclusions when researchers use the WPS as an observable outcome of monitoring.

This study also shows that how boards provide compensation matters. Prior research focuses on equity-based compensation as a package and few studies have examined the impact of

monitoring on the structure of equity-based compensation. I find that the ratio of restricted stock to the total equity-based compensation is negatively associated with ex-ante WPS and total pay level. Monitors at least partially use the structure of equity-based compensation to adjust the ex-ante WPS (contractual incentive pay).

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Appendix 1: Restricted Stock, Options, and the Portfolio of Cash and Options

1. Stock Grants vs. Option Grants

Stock and options differ in several ways: costs to a firm, incentive structures, accounting treatment, and tax implications.

Following prior research, I assume that a CEO is risk averse since she holds a portfolio that is not well diversified. A CEO can hedge her portfolio at cost but she is not able to hedge it continuously and she is not allowed to hold a short position of the firm's stock. All these constraints limit her ability to hedge. Therefore, it is reasonable to assume that CEOs are risk averse.

Options are riskier: $1 of options is worth less to a risk-averse CEO than $1 of stock, rendering them more expensive to the firm (e.g., (Oyer and Schaefer (2005))). In other words, a firm can lower the cost, by replacing options with restricted stock if the participation constraint is the binding constraint. On the other hand, $1 of options provides greater incentive than $1 of stock when options are in the money (e.g.,(Hall and Murphy (2000))). This makes options a cheaper way to compensate a CEO if the incentive compatibility constraint is the binding constraint. (Dittmann and Maug (2007)) find that the first effect dominates by calibrating the standard principal-agent model widely used in contract theory, where the CEO has exponential utility and only makes an effort decision. Their results suggest that the participation constraint is likely to be the binding constraint and it is more costly for a firm to use options than to use restricted stock to compensate its CEO.

The incentives provided by restricted stock and options are different along two dimensions. First, restricted stock provides a symmetric marginal incentive along the stock price at a given CEO wealth level. Restricted stock always has a delta equal to one at any price level. However, options provide an asymmetric marginal incentive. On the down side of the stock prices, the delta of the options approaches zero when they are deep out of the money. The options then provide negligible incentives to the CEO because a non-dramatic increase in the stock price will not change the option value. Contrary to this, the value of restricted stock will respond to any stock price change. On the upper side of the stock prices, $1 of options provides a higher delta than $1 of stock. Managers have stronger, if not distorted, incentives to boost the stock price when the options are deep in the money. (Kadan and Yang (2005)) find empirical evidence that deeply in-the-money executive stock options lead to more earnings management and insider trading at the vesting years of the options. The extent of this increases as the managers are granted more options. However, options tend to pay off in states in which CEO's marginal utility is already low, which means that the actual incentives created for a given sensitivity are much smaller for options than for stock ((Jenter (2002))).

Second, options encourage executive risk taking, which can mitigate problems with executive risk aversion. A CEO tends to be more risk averse than shareholders would otherwise prefer because her portfolio is not well diversified and is overinvested in the firm's assets. Holding options provides the CEO with incentives to take riskier projects because the value of an option increases in the riskiness of the underlying assets. Options can be used to align interests in risk taking and therefore increase shareholders wealth.

(Guay (1999)) finds that options, not restricted stock, can induce risk-averse managers to invest in valuable risk-increasing projects which they may otherwise forgo.

Prior to 2005, the accounting treatment discriminated between restricted stock and options. Before FAS 123 became effective, stock options did not need to be recognized as an expense when granted at, or out of, the money—however there is a real economic cost associated with the option grant. This accounting treatment helped overstate income. However, the cost of granting restricted stock was recognized as an expense. (Murphy (2002)) argues that the favorable accounting treatment toward options leads firms to erroneously view stock options as a low-cost way of compensating executives. The SEC adopted FAS 123 effective June 2005. The new rule requires public firms to expense option grants at fair value. Therefore, the driving force of earning management for the compensation choice between restricted stock and options were removed after 2005.

Accounting rules for expensing restricted stock and stock options, set by the Financial Accounting Standards Board (FASB), are separate from taxation rules, set by the Internal Revenue Service (IRS). FAS 123 does not have any impact on the tax implications of restricted stock or options.

A CEO is typically granted at-the-money options. There is no immediate tax implication upon receipt of these, for either the CEO or the firm. However, the firm expenses the options at the grant date, as per the new accounting rules. When options are exercised, the CEO pays tax on the difference between the stock price and the exercise price at the ordinary income tax rate.[16] The firm deducts the same amount as a

[16] There are two types of employee stock options: incentive stock options (ISOs) and nonqualified stock options (NQSOs or NSOs). ForISOs, the executive pays nothing upon exercise (provided that he continues

compensation expense for tax purposes. When the CEO sells the shares, she pays tax on the difference between the sale price and the market price at exercise of the option at the capital gains tax rate.

No immediate tax implication occurs upon receiving restricted stock. On the vesting date, the CEO has to pay tax on the market value of her stock at the ordinary income tax rate. The firm then gets a tax deduction equal to the fair value. When the CEO sells the shares, she will be taxed on the appreciation of the shares at the capital gains tax rate. The appreciation is not recognized as an expense for the firm.

From the perspective of the CEO, options enjoy favorable tax treatment because no tax liability occurs when the options are vested—whereas restricted stock imposes tax liability when the stock is vested.

2. Restricted Stock vs. Portfolios of Cash and Options

Restricted stock cannot be completely replicated by the portfolio of cash and options. Here I define cash as the compensation that is not dependent on firm performance. Assume the CEO receives a share of the stock with a price of S_0 when granted. To replicate the stock grant, we can grant x options[17] and cash to the CEO, where $S_0 = c + xC_0$ and $\Delta(stock) = \Delta(c + xC_0)$. S is the stock price where S_0 is the grant price of restricted stock; C is the option price where C_0 is the fair value of the option when granted; c is the value of cash compensation; x is the number of options granted; K is the exercise price equal to S_0; and Δ denotes delta – the sensitivity of the option's price change due to the price change

to hold the stock), and pays capital gains taxes when he eventually sells the stock. The firm, however, cannot deduct the gain as a compensation expense. Since most executives receive NQSOs, I focus here on NQSOs.

[17] Assume each option is written on 1 share of the stock.

of the underlying assets. The portfolio of cash and options has the same value and delta at the grant date. I use delta as the measure for ex-ante incentive to the CEO. More details for the measure are discussed in Section III.2.

One dollar of restricted stock is different from $1 of the portfolio of cash and options because $1 of restricted stock provides stronger incentives on the downside, and weaker marginal incentives on the upside, than $1 of the portfolio of cash and options. Graph A of Figure II shows the payoff of restricted stock and the portfolio of cash and options. The payoff of the share is linear. Any change of the stock price affects the CEO's wealth. Options, on the contrary, have a nonlinear relation to the stock price. When the price is lower than the exercise price, the CEO will choose not to exercise the options and will therefore only receive the cash compensation. When the price drops deeply below c, the CEO's wealth will not be impacted by the firm performance and her incentives deviate from shareholders on the downside. The portfolio of cash and options is not an efficient compensation contract when the stock market declines. When the stock price is higher than $S^* = xK - c$, the payoff of the portfolio is higher than the payoff of the stock for each unit increase of stock price. (Bertrand and Mullainathan (2000)) argue that if the CEO pay responds to luck, an asymmetric pay design can be used for rent extraction.

Graph B of Figure II shows a similar story to graph A. Stock has a constant delta equal to 1 at any price level. Stock options provide lower incentives when the stock price is low and higher incentives when the stock price is high. At-the-money options have a delta close to 0.5.[18] The replicated portfolio at grant will be composed of two options to

[18] If we use the Black-Scholes model to calculate delta, each at-the-money option has delta slightly above 0.5 and the delta is a function of risk-free interest rate, dividend yield, time to maturity and the return volatility.

have the same delta as one share of restricted stock. This results in a higher delta when the stock price moves up and a lower delta when the stock price moves down.

Cash does not provide any marginal incentive for any stock movement. The marginal incentive provided by the portfolio is the same as the marginal incentive provided by options only. That is to say, the CEO who holds the portfolio of cash and options has the same marginal incentive in risk-taking as if she holds the same number of options only. As long as the number of options in the portfolio exceeds the number of shares, the CEO—who receives the portfolio—has the incentive in picking riskier projects than she would otherwise prefer. The incentives in risk-taking provided by restricted stock, and the portfolio of cash and options, are therefore different.

However, restricted stock can be replaced by the portfolio of cash and options if the stock price change is small. Figure II shows that the payoffs and the deltas around the grant price, S_0, are close.

[Insert Figure II]

Appendix 2: Variable Definitions

# Analysts	The total number of analysts following the firm.
% Equity Pay $_t$	$\frac{(Value\ of\ Restricted\ Stock + Value\ of\ Options\ Granted)_t}{Total\ Compensation_t}$ The value of restricted stock and options grant in the total compensation of the year. The value of the restricted stock is the value when they are granted. The values of options are calculated using Black-Scholes model with dividend.
% Independent Directors	The ratio of independent outside directors. Independent outside directors are identified using the classification by RiskMetrics (RiskMetrics item CLASSIFICATION="I").
% Predicted Stock Awards	The expected value from the regressions for Table V panel A.
% Stock Awards	$\frac{ValueofRestrictedStock}{(ValueofRestrictedStock + ValueofOptions)}$ The proportion of restricted stock grant during the year (Compustat item RSTKGRNT for fiscal year 2005 and Compustat item STOCK_AWARDS_FV for fiscal year 2006 and after) in the sum of restricted stock grant and option grants during the year. The value of the option grants is calculated using Black-Scholes model with dividend.
%Stock in Existing Portfolio $_{t-1}$	Ratio of stock holdings to the total value of stock and options. The value of stock holding is determined by the price at the end of year (Compusat item PRCC_F) multiplied by the number of shares (Compustat item SHROWN_EXCL_OPTS). The value of options is calculated using Black-Scholes model with dividend.
ΔWealth	Change of the CEO's total wealth, including the value change of existing stock holdings, the value change of existing options, and the value of total compensation granted the year. The value change of existing stock holding is the last year's existing stock holdings (Compustat item SHROWN_EXCL_OPTS) multiplied by buy-and-hold annual return. The value change of existing options is the Black-Scholes value change of existing options held at the beginning of the year.
ΔSW	$\Delta(SW) = RET_t * MV_{t-1}$ It is defined as the market valuation (Compustat item MKVALT) at the end of the year prior multiplied by the buy-and-hold return of the year.
ΔSW*LT Top5	The product of ΔSW and LT Top5 $_{t-1}$
ΔSW*Outsider-Dominated Board	The product of ΔSW and Outsider-Dominated Board
ΔSW*Strong Board	The product of ΔSW and Strong Board $_{t-1}$
Age	The CEO's age at the year
CEO and Firm Fixed Effect	Dummies for CEO and firm pair (CO_PER_ROL)
Dividend Payout Ratio	The ex-date dividend per share (Compustat item DVPSX_F) divided by the fiscal year end share price (Compustat item PRCC_F)).

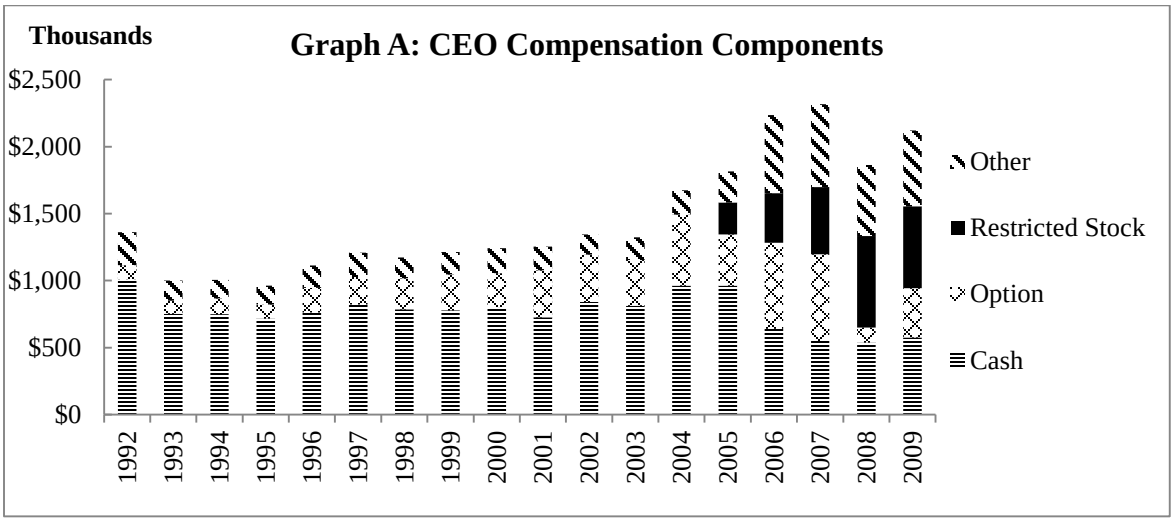
Continued	
Dividend Yield $_{t-1}$	Dividend yield is defined as the ex-date dividend per share (Compustat item DVPSX_F) divided by the fiscal year end share price (Compustat item PRCC_F)).
Ex-Ante WPS	$$WPS^{ex-ante} = \frac{Total\ Delta * Stock\ Price}{Aggregate\ Value}$$ Total Delta is the delta of the CEO's portfolio including all current and existing shares and options (see Edmans, Gabaix and Landier (2009) Appendix B for detailed calculation of deltas). Stock Price is the fiscal year end stock price (Compustat item PRCC_F). Aggregate Value is the market value of the firm's total assets where market value of a firm equals book value of total assets (Compustat item AT) less book value of equity (Compustat item BKV) plus market value of equity (Compustat item MKVALT). Then it is divided by 1000. The value of ex-ante WPS means the expected dollar value change due to $1000 increase in firm value.
Ex-Post WPS	$$WPS^{ex-post} = \frac{\Delta\$Wealth}{\Delta(Firm\ Value)}$$ $\Delta\$Wealth = RET_t * Stock\ Holding_{t-1} + \Delta\$Option\ Holding_{t-1} + Total\ Pay_t$. RET_t is the buy-and-hold return from year t-1 to t. $\Delta\$Option\ Holding_{t-1}$ is the total option value change due to the firm's stock price change from year t-1 to t. $\Delta(Firm\ Value) = RET_t * MV_{t-1}$.
Firm Fixed Effect	Dummies using GVKEY.
Industry Fixed Effect	Industry dummies. Industry is classified using Fama-French 30-industry classification.
Investment Opportunities	The average year-end market-to-book ratio over the prior five years (from year t-1 to year t-5). Market-to-book ratio=share price at the fiscal year end (Compustat item PRCC_F) / the book value of equity per share (Compustat item BKVLPS))
Leverage (Book Leverage)	The sum of long-term debt (Compustat item DLTT) and debt in current liabilities (Compustat item DLC) over the book value of assets (Compustat item AT).
Log (1+ # Analysts)	First, for each year, I collect the total number of analysts who forecast EPS for the firm 1 to 5 years forward. Then, I take the average of the numbers for the prior 3 years. Finally, I transform it by taking the log.
Log(MV) $_{t-1}$	The log value of the total shares outstanding at the end of the prior year (Compustat item MKVALT).
LT Top5	LT Top5 investors are the institutions which are 1) in the top 5 largest institutional holders of the firm the year and prior; and 2) are classified as independent or quasi-indexer by Bushee the year and prior.
M/B	The ratio of market price (Compustat item PRCC_F) to the book value per share (Compustat item BKVLPS).
Market Capitalization	The total market value of common equity in a firm (Compustat item MKVALT).

Continued	
Market Leverage	The sum of long-term debt (Compustat item DLTT) and debt in current liabilities (Compustat item DLC) the year over the market value of assets. Market value of assets is defined as the book value of total assets (Compustat item AT) less the book value of common equity (Compustat item CEQ) plus the market value of common equity (Compustat item MKVALT).
Outsider-Dominated Board	Outsider-Dominated Board is an indicator that is set equal to one for boards where more than half directors are independent. Otherwise, it is set to zero. It is recalculated each year.
R&D Dummy	It is one if the firm has missing value for R&D expenses and 0 otherwise.
Continued	
R&D Expenses $_{t-1}$	R&D $_{t-1}$ is the R&D expenses (Compustat item XRD) scaled by the total book assets (Compustat item AT) of the prior year.
Ratio of Restricted Stock to the Total Equity-based Compensation	$\frac{value\ of\ restricted\ stock\ grant_t}{value\ of\ restricted\ stock\ grant_t\ + value\ of\ the\ option\ grants_t}$ The value of the restricted stock grants is the total restricted stock awards during the fiscal year whose value is determined at the grant date (Compustat item RSTKGRNT for fiscal year 2005 and STOCK_AWARDS_FV for fiscal year 2006 and after). The value of option grants are the aggregate value of stock options granted to the executive during the year using dividend-adjusted Black-Scholes model.
RET	RET is the buy-and-hold annual return on the stock.
ROA	ROA is the ratio of earnings before interest and tax (Compustat item EBIT) to the book value of total assets (Compustat item AT) at the end of the year.
Sale	Total revenue of the year (Compustat item REVT).
SD Analyst forecast	The standard deviation of analyst forecasts. For each year and each forecast period, the standard deviation is defined as I/B/E/S item STDEV. I use 5 EPS forecasts periods: 1, 2, 3, 4, 5 years forecast period. Then I take the average standard deviation of each year's standard deviation over the five forecast periods. The value is the average value over the three years prior.
SD RET	The standard deviation of monthly buy-and-hold stock returns of the last five years (from year t-1 to year t-5)
SD ROA	The annual standard deviation of ROA of the last five years (from year t-1 to year t-5)
Strong Board	Strong Board is an indicator that is set equal to one for firms whose CEO's tenure is shorter than the median director of the board and zero otherwise. It is recalculated each year.
Total Assets	Book value of total assets (Compustat item AT).

Continued	
Total Compensation	The sum of salary, bonus, other annual, total value of restricted stock granted, total value of stock options granted (using Black-Scholes), long-term incentive payouts, and all other total. Total compensation = ExecuComp item TDC2- ExecuComp OPT_EXER_VAL + Black-Scholes Value of options granted
Year Fixed Effect	Year dummies.

Figure I: CEO Compensation from 1992 to 2009

Graph A shows the median components evolution of a year median ExecuComp CEO from 1992 to 2009. For each year, the total CEO pay is the ExecuComp median value for the year and the value of each component is the median percentage of the component in the year multiplied by the median total pay in the year. Cash is the sum of salary (Compustat item SALARY) and bonus (Compustat item BONUS). Restricted Stock is the fair value of all stock awards during the year (Compustat item RSTKGRNT for fiscal year 2005 and STOCK_AWARDS_FV for fiscal year 2006 and after). Option is the aggregate value of stock options granted to the executive during the year as valued using Black-Scholes methodology. All values are in 1992 constant dollars. Graph B shows the time trend for the median restricted stock grants proportion of total equity pay and the median percentage of firms that grant restricted stock to its CEO in each year from 1992 to 2009.



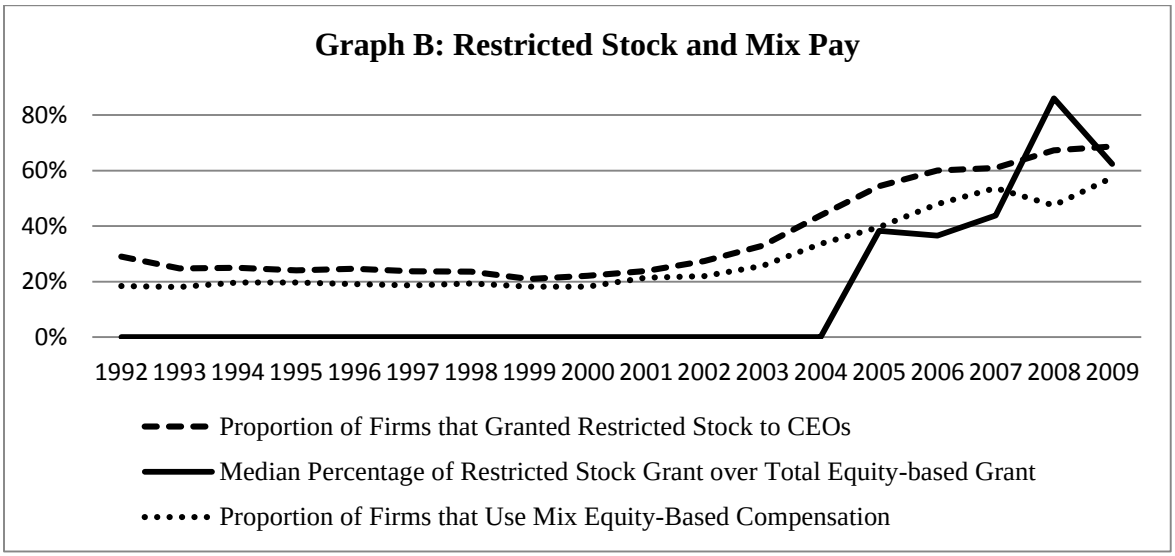
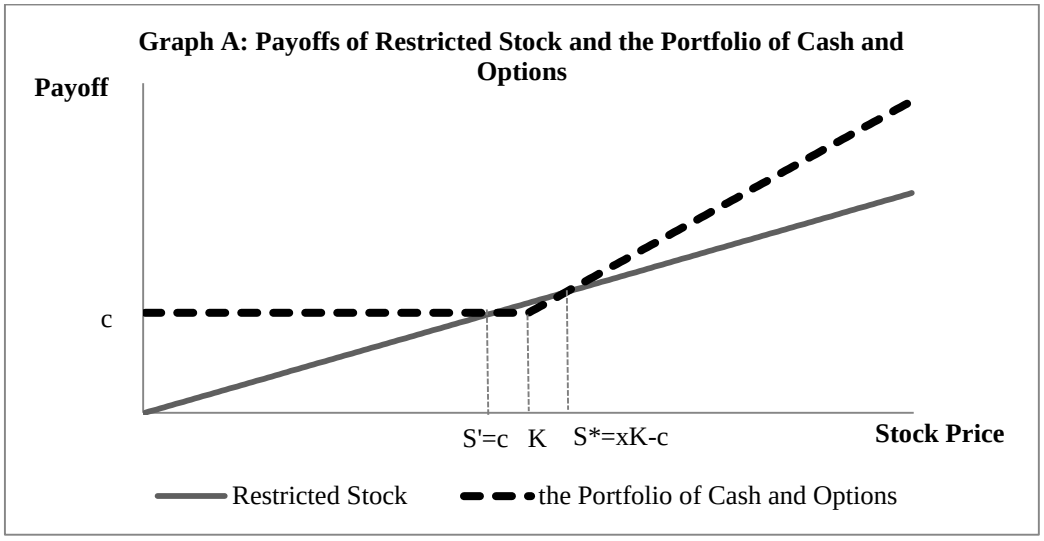


Figure II: Payoffs and Deltas of Restricted Stock and the Portfolio of Cash and Options

Graph A shows the payoffs of one share of restricted stock and the portfolio of cash and options. The portfolio has the same value and delta as the share of stock when granted. The options are granted at the money. The value of an option is calculated using Black-Scholes model. Assume one option writes on one share of the stock. K is the exercise price that is equal to the stock price at grant. c is the value of cash compensation. $c = S_0 - C_0$ where S_0 is the stock price at grant and C_0 is the Black-Scholes value of one option at grant. x is the number of options in the portfolio. Graph B shows the deltas of one share of restricted stock and the portfolio of cash and options.



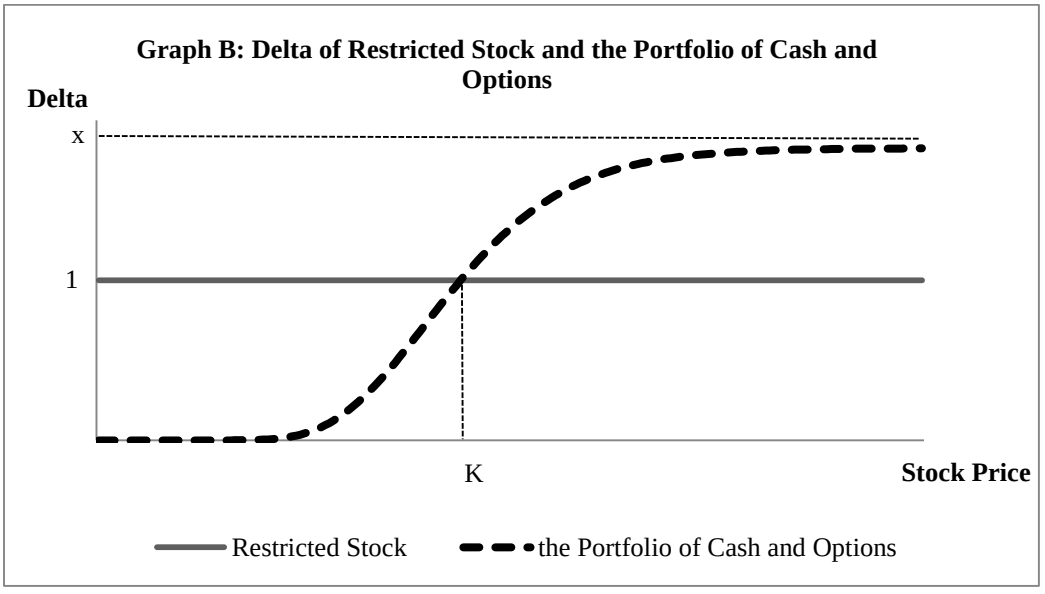


Table I: Competing Hypotheses

This table shows the competing predicted relations of CEO compensation and monitoring implied by the complements view and the substitutes view. Positive (negative) means that a positive (negative) relation is predicted under the view. For example, "H1a: positive" means a positive association between ex-ante WPS (row) and monitoring is predicted by the complements view (column).

	Monitoring	
	Complements View	*Substitutes View*
Total Contractual Incentive Pay	H1a: positive	H1b: negative
Total Pay	H2: negative	H2: negative
Proportion of Restricted Stock in the Total Equity-Based compensation	H3a: negative	H3b: positive

Table II: Summary Statistics of CEO Compensation

This table shows the summary statistics of CEO compensation for all the ExecuComp firms excluding financial and utilities firms from 1992 to 2009. Panel A provides the time series statistics for CEO compensation components. Panel B shows the evolution of firms that use the equity-based compensation to their CEOs. Medians are the median nominal values of all the ExecuComp firms in the year. %Firms Using Options Only = $\frac{\#\text{ Firms Using Options Only}_t}{\#\text{ Total Firms}_t}$; %Firms Using Restricted Stock Only = $\frac{\#\text{ Firms Using Stock Only}_t}{\#\text{ Total Firms}_t}$; % Firms Using Mix = $\frac{\#\text{ Firms Using Both Options and Restricted Stock}_t}{\#\text{ Total Firms}_t}$. All the other variables are defined in Appendix 2.

Panel A: CEO Compensation and Restricted Stock Grant

Year	Median Salary and Bonus (in Thousands)	Median Restricted Stock Grant (in Thousands)	Median Stock Option Grant (in Thousands)	Median Ratio of Restricted Stock Grant to Total Equity-based Compensation	Median Total Compensation (in Thousands)
	(1)	(2)	(3)	(4)	(5)
1992	965	0	0	0.00%	1,362
1993	721	0	38	0.00%	1,032
1994	691	0	32	0.00%	1,064
1995	718	0	31	0.00%	1,045
1996	770	0	76	0.00%	1,246
1997	854	0	115	0.00%	1,383
1998	824	0	139	0.00%	1,365
1999	825	0	144	0.00%	1,442
2000	875	0	147	0.00%	1,527
2001	818	0	252	0.00%	1,585
2002	925	0	232	0.00%	1,728
2003	1,000	0	190	0.00%	1,737
2004	1,178	0	261	0.00%	2,260
2005	1,235	0	249	38.30%	2,530
2006	815	101	308	36.60%	3,216
2007	778	479	285	43.80%	3,429
2008	820	613	2	86.00%	2,860
2009	831	579	142	62.40%	3,243

Panel B: Proportion of Firms that Use Options or Restricted Stock

Year	# Total Firms	% Firms Using Options Only	% Firms Using Stock Only	% Firms Using Mix
1992	169	71.01%	10.65%	18.34%
1993	509	75.25%	6.68%	18.07%
1994	661	75.04%	5.30%	19.67%
1995	695	75.97%	4.32%	19.71%
1996	766	75.33%	5.61%	19.06%
1997	803	76.34%	4.98%	18.68%
1998	861	76.42%	4.30%	19.28%
1999	883	79.05%	2.83%	18.12%
2000	895	77.88%	3.91%	18.21%
2001	896	76.23%	2.34%	21.43%
2002	932	72.64%	5.36%	22.00%
2003	940	67.02%	7.34%	25.64%
2004	993	56.09%	10.27%	33.64%
2005	1010	45.64%	14.75%	39.60%
2006	1139	39.95%	12.12%	47.94%
2007	1214	39.04%	7.33%	53.62%
2008	1161	32.73%	19.81%	47.46%
2009	1135	31.28%	11.28%	57.44%

Table III: Summary Statistics of Institutional Holdings, Board Strength, and Firm Characteristics

This table reports summary statistics for the LT Top5 ownership, board strength, and the firm characteristics. Panel A is the distribution of LT Top5 ownership from 2005 to 2009. N is the number of observations for the year in the sample. Mean is the average LT Top5 ownership in the year. 1st %, 25th %, Median, 75th % and 99th % are the values of the LT Top5 ownership at 1% tail, 25% tail, 50% tail, 75% tail and 99% tail, respectively. I then divide firms in each year into two groups: firms with strong boards (Strong Board=1) and firms with weak boards (Strong Board=0). Panel B provides the median values for firms with above and below median LT Top5 ownership. Panel C provides the median values for firms with strong and weak board. All the other variables are defined in Appendix 2.

Panel A: Descriptive Statistics of LT Top5 ownership, and Board Strength									
Year		N	Mean	1st %	25th %	Median	75th %	99th %	Std. Dev.
2005	Overall	1176	25.61%	3.98%	18.37%	25.26%	31.98%	49.68%	10.02%
	Strong Board	713	25.64%	3.96%	18.40%	25.06%	32.22%	50.50%	10.26%
	Weak Board	463	25.57%	6.49%	18.28%	25.42%	31.47%	48.91%	9.66%
2006	Overall	1233	26.62%	4.43%	19.95%	25.87%	32.54%	52.15%	9.71%
	Strong Board	761	26.16%	4.32%	19.78%	25.10%	32.03%	53.11%	9.80%
	Weak Board	472	27.36%	4.72%	20.56%	27.18%	33.63%	50.74%	9.54%
2007	Overall	1197	25.21%	3.78%	17.52%	24.14%	32.35%	53.85%	10.67%
	Strong Board	745	25.31%	4.41%	17.51%	23.80%	32.42%	55.08%	10.62%
	Weak Board	452	25.04%	1.52%	17.57%	24.53%	32.08%	52.93%	10.77%
2008	Overall	1169	26.39%	4.38%	19.01%	25.64%	33.02%	55.49%	10.35%
	Strong Board	735	26.62%	4.38%	18.87%	25.91%	33.91%	55.51%	10.57%
	Weak Board	434	26.01%	4.58%	19.56%	24.97%	31.63%	51.77%	9.98%
2009	Overall	1139	19.58%	0.00%	13.29%	18.74%	25.04%	49.44%	9.64%
	Strong Board	668	19.41%	0.00%	13.03%	18.28%	25.04%	49.39%	9.95%
	Weak Board	471	19.82%	0.00%	13.67%	19.27%	24.98%	49.97%	9.18%
Total	Overall	5914	24.73%	2.65%	17.43%	23.92%	31.26%	51.81%	10.41%
	Strong Board	3622	24.73%	1.98%	17.38%	23.77%	31.38%	52.62%	10.56%
	Weak Board	2292	24.74%	3.03%	17.50%	24.17%	30.99%	50.83%	10.16%

Panel B: Firm Characteristics (Medians)	2005			2006			2007		
Firm Characteristics	Below LT Top5 Median	Above LT Top5 Median	Difference	Below LT Top5 Median	Above LT Top5 Median	Difference	Below LT Top5 Median	Above LT Top5 Median	Difference
Total Assets (in Millions)	1,732	1,061	671***	1,887	975	912***	2,170	1,076	1,094***
Market Capitalization (in Millions)	2,305	1,234	1,071***	2,539	1,263	1,276***	2,959	1,087	1,872***
Sales (in Millions)	1,680	1,071	609***	1,832	1,021	811***	2,098	1,076	1,022***
ROA	10.30%	9.29%	1.01%**	10.95%	8.61%	2.34%***	11.15%	8.14%	3.01%***
RET	4.45%	-1.95%	6.40%***	9.68%	4.30%	5.38%**	3.34%	-10.18%	13.52%***
M/B	2.78	2.26	0.52***	2.84	2.3	0.54***	2.97	1.95	1.02**
SD ROA	2.78%	2.89%	-0.11%	2.46%	2.76%	-0.30%**	2.48%	2.82%	-0.34%
SD RET	37.88%	38.42%	-0.54%	33.64%	36.65%	-3.01%**	31.71%	33.27%	-1.56%
Book Leverage	47.66%	37.88%	9.78%*	48.36%	49.42%	-1.06%	51.09%	50.07%	1.02%
Market Leverage	8.36%	10.17%	-1.81%**	8.53%	10.13%	-1.60%	9.21%	12.58%	-3.37%***
Dividend Payout Ratio	0.11%	0.00%	0.11%**	0.27%	0.00%	0.27%***	0.14%	0.00%	0.14%***
# Analysts	4.58	5.06	-0.48	4.56	5.21	-0.65**	5.53	5.03	0.5
SD Analyst Forecast	5.77%	5.97%	-0.20%	5.03%	6.52%	1.49%***	5.20%	7.29%	2.09%***

Panel B Continued: Firm Characteristics (Medians)	2008			2009			Total		
Firm Characteristics	Below LT Top5 Median	Above LT Top5 Median	Difference	Below LT Top5 Median	Above LT Top5 Median	Difference	Below LT Top5 Median	Above LT Top5 Median	Difference
Total Assets (in Millions)	2,350	1,053	1,297***	2,773	1,011	1,762***	2,114	1,045	1,069***
Market Capitalization (in Millions)	1,824	625	1,199***	2,500	932	1,568***	2,392	1,021	1,371***
Sales (in Millions)	2,225	1,077	1,148***	2,389	897	1,492***	2,015	1,032	983***
ROA	10.97%	7.64%	3.33%***	9.31%	6.28%	3.03%***	10.51%	8.04%	2.47%***
RET	-33.61%	-40.64%	7.03%***	29.16%	32.54%	-3.38%	3.72%	-5.74%	9.46%***
M/B	1.82	1.3	0.52***	2.26	1.72	0.54***	2.54	1.89	0.65***
SD ROA	2.27%	2.71%	-0.44%***	2.22%	2.96%	-0.74%***	2.44%	2.82%	-0.38%***
SD RET	29.83%	33.11%	-3.28%***	30.29%	32.64%	-2.35%**	32.31%	34.49%	-2.18%***
Book Leverage	52.35%	52.66%	-0.31%	51.19%	48.38%	2.81%**	49.88%	50.04%	-0.16%
Market Leverage	13.35%	17.41%	-4.06%**	7.05%	11.88%	-4.83%**	10.13%	11.84%	-1.71%***
Dividend Payout Ratio	0.50%	0%	0.50%***	0.31%	0%	0.31%***	0.29%	0%	0.29%***
# Analysts	6.12	5.24	0.88***	4.43	6.01	1.58***	5.56	5.2	0.36**
SD Analyst Forecast	5.70%	8.23%	-2.53%***	6.24%	9.52%	-3.28%***	5.69%	7.16%	-1.47%***

Panel C: Firm Characteristics (Medians)	2005			2006			2007		
Firm Characteristics	Strong Board	Weak Board	Difference	Strong Board	Weak Board	Difference	Strong Board	Weak Board	Difference
Total Assets (in Millions)	1491	1151	340*	1512	1234	278	1766	1264	502**
Market Capitalization (in Millions)	1748	1481	267*	1840	1558	282	1817	1464	353*
Sales (in Millions)	1425	1161	264	1517	1223	294**	1678	1195	483**
ROA	9.81%	9.60%	0.21%	9.45%	9.77%	-0.32%	9.46%	9.43%	0.03%
RET	0.87%	0.41%	0.46%	7.14%	5.66%	1.48%	-3.00%	-4.00%	1.00%
M/B	2.45	2.57	-0.12	2.60	2.57	0.03	2.34	2.53	-0.19
SD ROA	2.61%	3.02%	-0.41%*	2.49%	2.81%	-0.32%	2.47%	2.90%	-0.43%*
SD RET	37.82%	38.71%	-0.89%	33.82%	36.33%	-2.51%	31.89%	34.85%	-2.96%
Book Leverage	17.77%	17.06%	0.71%	17.24%	18.73%	-1.49%	19.86%	17.92%	1.94%
Market Leverage	9.44%	9.70%	-0.26%	9.39%	9.78%	-0.39%	11.30%	9.96%	1.34%
Dividend Payout Ratio	0.09%	0.00%	0.09%	0.21%	0.00%	0.21%***	0.32%	0.00%	0.32%***
# Analysts	4.77	5.06	-0.29	4.89	5.05	-0.16	5.27	5.35	-0.08
SD Analyst Forecast	5.75%	6.07%	-0.32%	5.84%	5.60%	0.24%	6.43%	6.23%	0.20%

Panel C Continued: Firm Characteristics (Medians)	2008			2009			Total		
Firm Characteristics	Strong Board	Weak Board	Difference	Strong Board	Weak Board	Difference	Strong Board	Weak Board	Difference
Total Assets (in Millions)	1759	1301	458**	1605	1530	75	1632	1283	349***
Market Capitalization (in Millions)	1118	1074	44	1441	1403	38	1609	1396	213***
Sales (in Millions)	1833	1275	558***	1595	1203	392***	1614	1213	401***
ROA	9.28%	9.31%	-0.03%	7.99%	7.34%	0.65%	9.24%	9.07%	0.17%
RET	-38.41%	-36.54%	-1.87%	27.56%	32.89%	-5.33%	-1.38%	-1.10%	-0.28%
M/B	1.53	1.51	0.02	1.95	1.96	-0.01	2.14	2.19	-0.05
SD ROA	2.42%	2.66%	-0.24%	2.52%	2.57%	-0.05%	2.49%	2.78%	-0.29%***
SD RET	30.92%	33.46%	-2.54%	29.99%	33.25%	-3.26%***	32.53%	35.36%	-2.83%***
Book Leverage	21.41%	21.04%	0.37%	18.35%	18.76%	-0.41%	18.86%	18.57%	0.29%
Market Leverage	15.01%	15.05%	-0.04%	11.60%	11.90%	-0.30%	11.07%	10.85%	0.22%
Dividend Payout Ratio	0.36%	0.00%	0.36%***	0.00%	0.00%	0.00%***	0.13%	0.00%	0.13%***
# Analysts	5.63	5.84	-0.21	6.10	6.00	0.10	5.36	5.48	-0.12
SD Analyst Forecast	6.53%	7.14%	-0.61%	7.66%	8.33%	-0.67%	6.46%	6.50%	-0.04%

Table IV: Board Strength and Contractual Incentive Pay

This table reports the median and mean contractual incentive pay, measured by ex-ante WPS. The numbers in the table indicate the expected wealth increase of CEOs due to $1000 increase of shareholders wealth. Industries are defined by Fama and French's 30-industry classification. Uitilities and Financial industries are excluded. I use chi-squared test to test the medians, and t-test to test the means, of the two groups of each industry. *, **, *** indicates significance level at 10%, 5% and 1% respectively.

	Median Ex-Ante WPS			Average Ex-Ante WPS		
	Strong Board	Weak Board	Difference	Strong Board	Weak Board	Difference
Food Products	2.44	10.44	-8.00***	7.15	51.67	-44.52***
Beer & Liquor	2.05	8.99	-6.94	5.81	8.99	-3.18
Tobacco Products	0.15	0.17	-0.02	0.5	0.42	0.08
Recreation	3.91	7.75	-3.84	9.38	41.44	-32.06***
Printing and Publishing	2.96	28.10	-25.14***	6.53	39.72	-33.19***
Consumer Goods	3.26	0.47	2.79	11.14	24.05	-12.91**
Apparel	7.59	17.00	-9.41	7.86	31.34	-23.48***
Healthcare, Medical Equipment, Pharmaceutical Products	5.33	16.45	-11.12***	10.89	35.13	-24.24***
Chemicals	2.69	5.76	-3.07***	8.00	15.56	-7.56*
Textiles	0.92	22.27	-21.35*	16.49	25.16	-8.67
Construction and Construction Materials	4.14	9.56	-5.42***	8.07	16.51	-8.44***
Steel Works etc.	1.67	6.37	-4.70***	4.68	10.02	-5.34***
Fabricated Products and Machinery	3.49	9.03	-5.54***	5.23	16.54	-11.31***
Electrical Equipment	5.97	19.02	-13.05***	6.92	57.08	-50.16***
Automobiles and Trucks	2.45	8.88	-6.43***	4.40	21.70	-17.3***
Aircraft, Ships, and Railroad Equipment	3.19	5.92	-2.73***	3.88	5.90	-2.02**
Precious Metals, Non-Metallic, and Industrial Metal Mining	1.56	2.29	-0.73	5.12	2.75	2.37
Coal	2.37	4.53	-2.16	3.04	4.19	-1.15
Petroleum and Natural Gas	2.42	6.59	-4.17***	4.63	15.75	-11.12***
Communication	0.89	1.79	-0.90	3.71	22.57	-18.86**
Personal and Business Services	4.93	15.31	-10.38***	10.82	37.01	-26.19***
Business Equipment	4.34	12.54	-8.20***	7.33	30.36	-23.03***
Business Supplies and Shipping Containers	1.98	4.19	-2.21***	4.20	5.28	-1.08
Transportation	2.29	7.97	-5.68***	5.04	24.45	-19.41***
Wholesale	3.87	10.15	-6.28***	6.27	26.67	-20.4***
Retail	3.81	5.16	-1.35**	7.99	16.21	-8.22***
Restaurants, Hotels, Motels	4.81	21.87	-17.06***	9.49	42.02	-32.53***

Table V: Monitoring and Contractual Incentive Pay

This table reports the estimates for regressions of ex-ante wealth-to-performance sensitivity (ex-ante WPS) against the ownership of influential institutional investors, board strength, and other firm characteristics. All the variables are defined in Appendix 2. All the regressions include year and industry fixed effect. All errors are robust and clustered at firm level. The numbers in parentheses are the robust standard errors. *, **, *** indicates significance level at 10%, 5% and 1% respectively.

	(1)	(2)	(3)	(4)
	Ex-ante WPS			
LT Top5 $_{t-1}$	-0.191*	-0.215**	-0.201*	-0.193*
	(0.098)	(0.105)	(0.105)	(0.103)
Strong Board $_{t-1}$	-15.280***	-14.560***		
	(1.987)	(1.928)		
% Independent Directors $_{t-1}$			-0.270**	-0.294**
			(0.118)	(0.125)
Log (1+ # Analysts)		-4.044*		-2.197
		(2.198)		(2.726)
SD Analysts Forecast		-1.473		-0.528
		(1.254)		(1.550)
Log(MV) $_{t-1}$	-2.252***	-1.885***	-2.793***	-2.451***
	(0.513)	(-3.15)	(0.643)	(0.620)
Investment Opportunities	-0.009	-0.004	0.002	0.002
	(0.011)	(0.009)	(0.004)	(0.004)
SD ROA	0.218*	0.199	0.281	0.304
	(0.130)	(0.149)	(0.186)	(0.190)
SD RET	0.104	0.214	0.092	0.127
	(0.174)	(0.170)	(0.204)	(0.201)
Lev $_{t-1}$	-0.211***	-0.217***	-0.173***	-0.179***
	(0.051)	(0.047)	(0.050)	(0.053)
Age $_{t}$	0.290**	0.346**	0.555***	0.588***
	(0.136)	(0.140)	(0.128)	(0.134)
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
N	4792	4326	2731	2637
R^2	9.74%	11.69%	9.11%	9.88%

Table VI: Monitoring and the Structure of Equity-based Compensation

Panel A reports estimates for regressions of ratios of restricted stock awards to the total equity compensation on the ownership of influential institutional investors, board strength, and other firm characteristics. Panel B reports estimates for regressions of ex-ante WPS against predicted values of the ratios of restricted stock awards to the total equity compensation from corresponding regressions in panel A, influential institutional holdings, board strength, and controls. All the variables are defined in Appendix 2. All the regressions include year and industry fixed effect. All errors are robust and clustered at firm level. The numbers in parentheses are the robust standard errors. *, **, *** indicates significance level at 10%, 5% and 1% respectively.

Panel A: Stock Awards	(1)	(2)	(3)	(4)
	% Stock Awards			
	OLS		Tobit	
LT Top $_{t-1}$	0.171**	0.144*	0.335***	0.275**
	(0.080)	(0.083)	(0.124)	(0.127)
Strong Board $_{t-1}$	8.122***	7.376***	14.330***	12.760***
	(1.628)	(1.701)	(2.461)	(2.510)
Log(1+ # Analysts)		0.869		1.748
		(2.538)		(3.543)
SD Analysts Forecast		2.454*		4.133
		(1.265)		(2.554)
R&D Expenses $_{t-1}$	0.002	0.001	0.003	0.002
	(0.001)	(0.001)	(0.002)	(0.002)
R&D Dummy	1.597	1.869	3.921	4.579
	(2.347)	(2.433)	(3.181)	(3.248)
%Stock in Existing Portfolio $_{t-1}$	0.228***	0.226***	0.461***	0.447***
	(0.025)	(0.026)	(0.041)	(0.042)
Log(MV) $_{t-1}$	3.462***	3.272***	7.014***	6.610***
	(0.730)	(1.045)	(1.062)	(1.461)
SD ROA	-0.622***	-0.608***	-1.391***	-1.296***
	(0.170)	(0.172)	(0.288)	(0.302)
SD RET	0.213	0.164	0.400	0.281
	(0.207)	(0.221)	(0.325)	(0.344)
Leverage $_{t-1}$	0.056	0.086	0.158**	0.210***
	(0.049)	(0.056)	(0.067)	(0.073)
Dividend Yield $_{t-1}$	0.964***	0.733**	2.055***	1.384**
	(0.292)	(0.329)	(0.591)	(0.605)
Investment Opportunities	-0.035***	-0.033***	-0.393**	-0.277
	(0.009)	(0.008)	(0.197)	(0.175)
ROA $_{t-1}$	-0.210***	-0.310***	-0.339***	-0.549***
	(0.076)	(0.087)	(0.117)	(0.127)
RET $_{t-1}$	0.012	0.024	0.030	0.055
	(0.017)	(0.019)	(0.033)	(0.036)
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
N	4394	4002	4394	4002
R^2	11.23%	11.56%	1.82%	1.85%

Panel B: Ex-Ante WPS	(1)	(2)	(3)	(4)	(5)
		Ex-ante WPS			
		OLS		Tobit	
% Stock Awards $_{t}$	-0.155***				
	(0.019)				
% Predicted Stock Awards $_{t}$		-0.174***	-0.170***	-0.095***	-0.095***
		(0.030)	(0.036)	(0.016)	(0.020)
LT Top5 $_{t-1}$		-0.131	-0.159*	-0.130	-0.158*
		(0.088)	(0.090)	(0.088)	(0.090)
Strong Board $_{t-1}$		-13.550***	-13.590***	-13.590***	-13.610***
		(1.681)	(1.751)	(1.686)	(1.752)
Log (# Analysts)			-4.915**		-4.877**
			(2.155)		(2.154)
SD Analysts Forecast			-0.937		-0.931
			(1.202)		(1.203)
R&D Expenses $_{t-1}$	-0.001	-0.001*	-0.001	-0.001*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
R&D Dummy	0.499	-1.577	-0.996	-1.482	-0.886
	(2.240)	(1.800)	(1.719)	(1.799)	(1.719)
Log(MV) $_{t-1}$	-2.210***	-1.757***	-1.197*	-1.704***	-1.139*
	(0.591)	(0.597)	(0.649)	(0.596)	(0.649)
Investment Opportunities	-0.003	-0.013*	-0.013	-0.022***	-0.020**
	(0.008)	(0.008)	(0.009)	(0.008)	(0.009)
SD ROA	0.185	0.139	0.213	0.127	0.209
	(0.136)	(0.122)	(0.163)	(0.122)	(0.163)
SD RET	0.243	0.128	0.225	0.133	0.227
	(0.194)	(0.174)	(0.183)	(0.174)	(0.183)
Leverage $_{t-1}$	-0.251***	-0.187***	-0.204***	-0.185***	-0.200***
	(0.053)	(0.044)	(0.046)	(0.044)	(0.045)
Age $_{t}$	0.778***	0.364***	0.411***	0.363***	0.411***
	(0.155)	(0.139)	(0.142)	(0.139)	(0.142)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes
N	4616	4358	3970	4358	3970
R^2	10.42%	12.32%	13.56%	12.27%	13.54%

Table VII: Monitoring and Cash Payments

Panel A reports estimates for regressions of cash against the ownership of influential institutional investors, board strength, and other firm characteristics. The dependent variable salary for column (1)-(3), the sum of salary and bonus for column (4)-(6), salary scaled by total column (7), and the sum of salary and bonus scaled by total compensation for column (8). Panel B reports estimates for regressions of ratios of restricted stock awards to the total equity compensation against cash, institutional holdings, board strength, and other firm characteristics. All the other variables are defined in Appendix 2. All the regressions include year and industry fixed effect. All errors are robust and clustered at firm level. The numbers in parentheses are the robust standard errors. *, **, *** indicates significance level at 10%, 5% and 1% respectively.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Salary			Salary+Bonus		Salary%	(Salary+Bonus)%
LT Top5 $_{t-1}$			0.177			-4.213	0.007	-0.0384
			(0.560)			(3.328)	(0.038)	(0.041)
Strong Board $_{t-1}$			-4.437			-216.7**	0.331	0.0767
			(13.620)			(107.5)	(0.721)	(0.820)
Log (1+# Analysts)			-23.020			150.5	-1.304	-1.724
			(15.650)			(136.9)	(1.085)	(1.244)
SD Analysts Forecast			2.353			-40.820	2.695***	2.289***
			(6.360)			(33.230)	(0.604)	(0.629)
Log(MV) $_{t-1}$		136.9***	160.1***		289.1***	296.9***	-5.745***	-6.144***
		(5.298)	(8.087)		(21.240)	(41.900)	(0.404)	(0.478)
SD ROA			-5.609***			-17.630**	0.055	0.0602
			(1.376)			(7.568)	(0.080)	(0.102)
SD RET			1.378			11.120	-0.286***	-0.357***
			(1.457)			(7.416)	(0.097)	(0.116)
Investment Opportunities			-0.024			-0.677	-0.002	-0.0147
			(0.111)			(0.444)	(0.009)	(0.011)
ROA $_{t-1}$			-4.384***			-7.841***	-0.047	-0.0442
			(0.626)			(2.220)	(0.039)	(0.043)
RET $_{t-1}$			-0.566***			-0.151	-0.067***	-0.0602***
			(0.118)			(0.824)	(0.010)	(0.011)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	5992	5989	4663	5992	5989	4663	4650	4650
R^2	11.16%	43.99%	48%	6.67%	10.84%	10.78%	26.42%	29.65%

Panel B	(1)	(2)	(3)	(4)
		% Stock Awards		
Salary $_{t}$	0.011***			
	(0.003)			
Salary+Bonus $_{t}$		0.000		
		(0.000)		
%Salary $_{t}$			-0.563***	
			(0.043)	
%(Salary+Bonus) $_{t}$				-0.481***
				(0.036)
LT Top5 $_{t-1}$	0.144*	0.146*	0.164**	0.138*
	(0.082)	(0.083)	(0.078)	(0.079)
Strong Board $_{t-1}$	7.423***	7.426***	7.728***	7.514***
	(1.688)	(1.702)	(1.649)	(1.634)
Log(# Analysts)	1.157	0.826	0.244	0.257
	(2.517)	(2.540)	(2.478)	(2.456)
SD Analysts Forecast	2.456*	2.471*	3.798***	3.272***
	(1.273)	(1.266)	(1.230)	(1.248)
R&D Expenses $_{t-1}$	0.001	0.001	0.002*	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
R&D Dummy	1.615	1.795	2.082	2.632
	(2.421)	(2.435)	(2.336)	(2.346)
%Stock in Existing Portfolio $_{t-1}$	0.227***	0.226***	0.214***	0.216***
	(0.026)	(0.023)	(0.026)	(0.026)
Log(MV) $_{t-1}$	1.574	3.200***	0.079	0.171
	(1.171)	(1.049)	(1.054)	(1.033)
SD ROA	-0.565***	-0.605***	-0.596***	-0.573***
	(0.173)	(0.172)	(0.172)	(0.171)
SD RET	0.156	0.162	-0.003	-0.066
	(0.221)	(0.222)	(0.219)	(0.215)
Leverage $_{t-1}$	0.070	0.085	0.048	0.061
	(0.056)	(0.056)	(0.053)	(0.054)
Dividend Yield $_{t-1}$	0.650**	0.734**	0.788**	0.743**
	(0.331)	(0.329)	(0.326)	(0.309)
Investment Opportunities	-0.032***	-0.033***	-0.032***	-0.038***
	(0.008)	(0.008)	(0.009)	(0.010)
ROA $_{t-1}$	-0.270***	-0.308***	-0.364***	-0.362***
	(0.085)	(0.087)	(0.089)	(0.087)
RET $_{t-1}$	0.030	0.024	-0.014	-0.007
	(0.019)	(0.019)	(0.019)	(0.019)
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
N	4002	4002	3998	3998
R^2	11.98%	11.58%	16.33%	16.47%

Table VIII: Total CEO Compensation

This table reports the results of total CEO compensation levels on equity-based compensation structure, or the ownership of influential institutional investors and board strength. The compensation data was obtained from ExecuComp. All the variables are defined in Appendix 2. All the regressions include year and industry fixed effect. All errors are robust and clustered at firm level. The numbers in parentheses are the robust standard errors. *, **, *** indicates significance level at 10%, 5% and 1% respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Total Compensation					
% Stock Awards $_{t}$		-19.480***			-17.550***	-13.970***
		(4.489)			(4.286)	(3.702)
% Equity Pay		131.9***			128.2***	112.2***
		(9.568)			(9.561)	(7.622)
LT Top5 $_{t-1}$			-28.320*	-25.740*	-22.220	-21.830*
			(14.500)	(13.700)	(14.030)	(12.980)
Strong Board $_{t-1}$			-797.7**	-578.2*	-798.5**	-507.0
			(382.3)	(331.1)	(364.8)	(324.1)
Log (1+ # Analysts)				4229.7***		3272.2***
				(409.6)		(391.8)
SD Analysts Forecast				-423.4**		-321.3
				(186.7)		(202.1)
Sale $_{t-1}$	0.091***	0.081***	0.087***	0.064***	0.077***	0.060***
	(0.021)	(0.019)	(0.020)	(0.015)	(0.018)	(0.014)
Investment Opportunities	-0.442	0.144	-1.078	-0.735	-0.766	0.196
	(2.221)	(1.498)	(2.842)	(1.597)	(2.246)	(1.348)
ROA $_{t-1}$	45.320***	9.999	49.020***	37.760**	12.870	9.999
	(14.590)	(12.370)	(16.190)	(17.430)	(14.140)	(15.760)
RET $_{t-1}$	13.730***	5.925**	13.780***	22.590***	6.247**	15.620***
	(2.416)	(2.541)	(2.607)	(2.971)	(2.663)	(2.800)
SD ROA	45.010	8.976	44.280	49.410	7.670	28.580
	(29.100)	(26.510)	(33.320)	(36.860)	(30.920)	(34.170)
SD RET	-192.8***	-176.7***	-191.1***	-83.200***	-169.5***	-88.330***
	(29.550)	(28.810)	(29.480)	(29.130)	(28.660)	(29.190)
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
N	5642	5251	5164	4652	4821	4368
R^2	10.68%	21.35%	11.73%	19.45%	22.24%	28.86%

Table IX: Monitoring and Realized WPS

Column (1) and (2) report the estimates for regressions of ex-post wealth-to-performance sensitivity against the ownership of influential institutional investors, board strength, and other firm characteristics. Column (3)-(5) report estimates for regressions of changes of CEOs' wealth against the change of shareholders wealth, the interaction between the change of shareholders wealth and the ownership of influential institutional investors, the interaction between the change of shareholders wealth and board strength, and controls. All the variables are defined in Appendix 2. All the regressions include year and industry fixed effect. All errors are robust and clustered at firm level. The numbers in parentheses are the robust standard errors. *, **, *** indicates significance level at 10%, 5% and 1% respectively.

Panel A	(1)	(2)	(3)	(4)
	Ex-Post WPS			
LT Top5 $_{t-1}$	-0.131	-0.122	-0.345**	-0.296*
	(0.117)	(0.119)	(0.155)	(0.162)
Strong Board $_{t-1}$	-0.965	-2.096		
	(2.509)	(2.662)		
%Independent Directors $_{t-1}$			0.077	0.054
			(0.115)	(0.116)
Log (1+ # Analysts)		0.441		-1.651
		(3.620)		(4.621)
SD Analyst Forecast		-1.23		0.225
		(1.090)		(1.867)
Log (MV) $_{t-1}$	-2.088**	-1.814	-2.892**	-1.646
	(0.925)	(1.202)	(1.202)	(1.657)
Investment Opportunities	-0.006	-0.005	-0.003	-0.001
	(0.013)	(0.014)	(0.015)	(0.015)
SD ROA	-0.027	0.213	0.116	0.090
	(0.302)	(0.330)	(0.372)	(0.382)
SD RET	-0.202	-0.058	-0.713*	-0.423
	(0.285)	(0.284)	(0.407)	(0.397)
Leverage $_{t-1}$	0.004	-0.002	0.013	0.008
	(0.061)	(0.065)	(0.095)	(0.096)
Age $_{t}$	0.120	0.143	0.204	0.169
	(0.160)	(0.162)	(0.200)	(0.205)
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
N	4529	4100	2689	2604
R^2	1.18%	1.16%	1.40%	1.37%

Panel B	(1)	(2)	(3)	(4)	(5)	(6)
	ΔCompensation					
ΔSW	3.043***	3.197**	3.277**	3.861	1.101	1.068
	(1.069)	(1.462)	(1.338)	(3.048)	(4.945)	(4.434)
LT Top5 $_{t-1}$	-29.950	-15.800	0.993	9.153	39.535	101.63
	(26.450)	(60.100)	(50.030)	(39.071)	(95.270)	(70.627)
Strong Board $_{t-1}$	698.2	4465.7**	2883.1**			
	(682.3)	(2030.6)	(1334.0)			
Outsider-Dominated Board $_{t-1}$				-770.77	-256.19	308.64
				(1966.3)	(2974.7)	(2220.5)
ΔSW*LT Top5	0.066*	0.042	0.045	0.047	0.052	0.071
	(0.036)	(0.044)	(0.041)	(0.046)	(0.054)	(0.046)
ΔSW*Strong Board	-2.229***	-1.980**	-2.167**			
	(0.699)	(0.988)	(0.925)			
ΔSW*Outsider-Dominated Board				-2.125	-0.128	-0.292
				(2.899)	(4.763)	(4.300)
Log (1+ # Analysts)	340.0	3276.6	1880.7	1472.5	-3058.8	-3359.1
	(680.3)	(2878.4)	(2540.9)	(1234.0)	(3442.9)	(2643.7)
SD Analyst Forecast	-592.9	-2124.6	-2160.0*	-1252.3*	-4642.0*	-4129.2**
	(518.2)	(1440.8)	(1260.6)	(666.9)	(2409.7)	(1899.1)
Log (MV) $_{t-1}$	815.7**	-5642.4***	-4558.3***	1532.0***	-8331.0***	-7292.3***
	(338.1)	(1340.4)	(1506.5)	(596.8)	(2757.4)	(2108.2)
Investment Opportunities	-1.738			-0.716		
	(3.154)			(4.263)		
M/B $_{t-1}$		-2.661	-6.723		-14.19	-21.040
		(6.548)	(7.509)		(12.852)	(18.274)
SD ROA	-2.119			69.624		
	(45.870)			(116.694)		
SD RET	46.770			115.398		
	(57.810)			(130.79)		
Leverage $_{t-1}$	41.180***			61.811**		
	(14.070)			(25.633)		
Age $_{t}$	140.0**			334.94***		
	(61.870)			(99.358)		
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	-	-	Yes	-	-
CEO and Firm Fixed Effect	No	Yes	No	No	Yes	No
Firm Fixed Effect	No	-	Yes	No	-	Yes
N	4529	4833	4833	2689	2852	2852
R^2	24.41%	46.84%	39.70%	20.37%	61.38%	52.85%