The Impact of CEO Compensation on Analyst Coverage

Shin-Rong Shiah-Hou

Department of Finance, College of Management, Yuan Ze University, Taoyuan 32003, Taiwan, Tel: +886-3-4638800 (ext. 2663);Fax:886-3-4354624; e-mail: fnshiah@saturn.yzu.edu.tw

Abstract

This paper examines whether an incremental effect of analysts serves as external monitoring of CEO compensation. Overall, based on coverage, I find a strong positive relation to CEO pay-for-performance sensitivities (Delta and Vega), total compensation, and excess total compensation (industry-adjusted total compensation). I also use the G_index generated from Gompers et al. (2003) to explore the effect of managerial entrenchment on CEO compensation structure. I find evidence that firms with weaker internal corporate governance (higher G_index) will have lower CEO pay-for-performance sensitivities due to CEO's risk aversion and higher total compensation due to CEO's influence on compensation decisions. After controlling for the G_index, these results support the hypothesis that analysts' activities influence CEO compensation structures. Finally, I find that the effect of coverage dominates the effect of managerial entrenchment on the CEO pay-for-performance sensitivity and total compensation.

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Key Words: Analyst Coverage, Pay-for-Performance Sensitivity, CEO Compensation, Compensation Structure

1. Introduction

Bergstresser and Philippon (2006) observe that the median exposure of CEO wealth to firm stock prices tripled between 1980 and 1994, and doubled again between 1994 and 2000. Firms often agree that the increase in CEO wealth in relation to stock prices is an appropriate approach to link management incentives with the interests of shareholders. Although increasing incentive-based compensation is motivated by a desire to align managers' incentives with those of stockholders, it also creates problems. It has recently been found that large option packages increase the incentives for managers to manipulate their firms' reported earnings[1]. Even if stock options lead to problems, it is clear that CEOs' equity-linked compensation strongly affects CEO actions. Bulan et al. (2010) show that the CEOs' equity-linked compensation is effective for most firms in their sample.

The equity-linked compensation of CEOs may engender two problems. First, some researchers (e.g. Healy, 1985; Balsam, 1998, and Bartov and Mohanram, 2004; Bergstresser and Philippon, 2006) find that managers with greater stock-based compensation have greater incentives to engage in earnings management to increase the future value of their stock options. Second, stock-based compensation may create other forms of agency costs stemming from the risk aversion of the firm's CEO. Because the typical CEO has the great portion of his or her wealth invested in the firm, and cannot diversify his or her job, the CEO has an incentive to reduce risk beyond the level that more diversified stockholders would wish. Since there is a direct link between the managerial compensation plan (stock option) and movements in the stock price, the managers' wealth is determined by stock price. Thus, this compensation plan decreases a risk-averse manager's desire to take risk (Carpenter, 2000; and Lamber et al., 1991). In such a situation, managers would serve their own individual interests and fail to maximize stockholder wealth.

Stockholders seek compensation plans that can increase CEO performance but do not induce earnings management or agency problems. From a rational investor's standpoint, the firms' design of its option-based executive compensation plan is crucial. The mechanisms of corporate governance may help investors to monitor the CEO's compensation contract. Therefore, in 2002, SEC promulgated a set of new regulations that enhance the responsibility of independent directors to set an optimal executive compensation plan[2].

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[1] See, for example, the 9 January, 2004 New York Times article by Gretchen Morgenson: "Options packages encourage executives to fiddle books."

[2] NYSE and Nasdaq mandate that the compensation committee, nominating committee, and audit

Several empirical studies have shown a relationship between corporate governance mechanisms and executive compensation[3]. For example, Hartzell and Starks (2003) find that institutional ownership concentration is positively associated with the pay-for-performance sensitivity of executive compensation. Fahlenbrach (2009) uses board size, board independence, CEO-chair duality, institutional ownership concentration, CEO tenure, and an index of shareholder rights (G_index) as proxy variables of corporate governance to test the effect of corporate governance on CEO compensation structure.

Generally, the characteristics of the board and institutional ownership are very difficult for outsider investors to observe. For rational investors, monitoring CEO actions through external groups that are easily observable could help in determining an optimal compensation contract. However, only limited research has been done on the relationship between CEO compensation contracts and the monitoring of external groups.

In practice, financial analysts collect information from public and private sources, evaluate the current performance of firms, make forecasts about their future prospects, and recommend buying, holding, or selling the stock. Chung and Jo (1996) show that financial analysts' monitoring of corporate performance helps motivate managers to maximize their firms' value. Thus, analysts' monitoring function can reduce the agency costs associated with the separation between ownership and control. At the same time, they also argue that analysts serve as information intermediaries to help expand the breadth of investor cognizance. Managers consider analysts one of the most important groups affecting their companies' stock price[4]. Therefore, analysts play a key role in monitoring the activities of managers. However, the effect of analysts' action on CEO compensation remains unclear. The purpose of this paper is thus to examine whether there is an incremental effect of analyst monitoring on CEO compensation contracts.

Three hypotheses explain the effect of governance on executive compensation contracts, including the substitution hypothesis, the entrenchment hypothesis, and the complementarity hypothesis. The substitution hypothesis predicts that the quality of a firm's corporate governance is negatively related to CEO pay-for-performance sensitivity and total compensation. By contrast, the complementarity hypothesis

committee shall consist of independent directors, and the compensation committee and the nomination committee must have a written charter that defines the obligations of these committees.

[3] See Lippert and Moore (1995); Bebchuk and Fried (2004); and Fahlenbrach (2009).

[4] See Graham et al. (2005).

predicts that the quality of a firm's corporate governance is positively related to CEO pay-for-performance sensitivity and total compensation. The entrenchment hypothesis predicts that the quality of a firm's corporate governance is positively related to CEO pay-for-performance sensitivity, but negatively related to total compensation. All hypotheses predict that governance is related to compensation through reducing agency problems generated from conflict of interests between shareholders and CEO.

I use analyst coverage to define the actions of analysts. Analysts, who have good training in finance, are able to evaluate corporate financial statements on a professional basis. Chung and Ho (1996) and Yu (2008) indicate that analysts prefer to cover firms that have accurate financial disclosures. Lang and Lundholm (1996) provide evidence that firms with more information disclosure policies have more analyst coverage. Therefore, it appears logical that the more the analyst coverage of a given firm, the lower the information asymmetry, and the smaller the agency problem. Based on this, if compensation contracts can help reduce agency problem through decreases in information asymmetry, I predict that analysts' coverage can reflect the performance of the CEO's compensation contract.

I employ several different measures of compensation structure. First, I assess pay-for-performance sensitivity of CEO's compensation through two measures[5]: the sensitivity of the value of stock and stock option grants to stock price (called Delta), and the sensitivity of the value of stock and stock option grants to stock return volatility (called as Vega). Second, I consider the level of compensation including cash compensation (salary and bonus), excess cash compensation (industry-adjusted cash compensation), total compensation[6], and excess total compensation (industry-adjusted total compensation).

Overall, based on coverage, I find a strong positive relation to CEO pay-for-performance sensitivities (Delta and Vega), total compensation, and excess total compensation (industry-adjusted total compensation). Even after controlling for all related variables, the effects always appear economically large. The influence of analysts' coverage may occur indirectly through their activities as well as through direct pressure. For example, Yu (2008) suggests that analyst coverage is endogenous and may depend on firm size, growth, cash flow volatility, or past performance. To address endogeneity concerns in estimating the relationship between analysts' activities and managerial compensation, I employ a 2SLS methodology to deal with

[5] I follow Core and Guay's (2002) methodology to estimate option value, and follow Bulan, Sanyal, and Yan (2010) to estimate Delta and Vega.

this problem. These results also provide support for the hypothesis that analysts' activities influence CEO compensation structures.

Several studies have discussed whether entrenched managers have too much power over their compensation structures. Therefore, I use the G_index generated from Gompers et al. (2003) to consider the effect of managerial entrenchment on CEO compensation structure. I find evidence that firms with weaker internal corporate governance (higher G_index) will have lower CEO pay-for-performance sensitivities due to CEO risk aversion and higher total compensation due to the influence of the CEO on compensation decisions. After controlling for G_index, these results support the hypothesis that analysts' activities influence CEO compensation structures.

Internal governance mechanisms, as measured by G_index, have a monitoring function in the capital market. I conjecture that the same principle may apply to the activities of analysts. Moreover, I discuss the effect on compensation structure for firms with heavy use of one mechanism but not the other. In support of this view, the results show that firms in the Dictatorship/high coverage group tend to have higher pay-for-performance sensitivities and higher level of compensation than their counterparts in the Democracy/low coverage group.

2. Development and Key Hypothesis

The optimal compensation contract seeks to link the interests of the entrepreneur with those of external financing claimants. These contracts frequently require entrepreneurs to disclose relevant information that help investors to monitor executive actions and to evaluate whether entrepreneurs have directed the firm's resources based on the interests of external owners. On the other hand, information intermediaries, such as financial analysts, rating agencies and institutional investors, use their professional knowledge to convey private information that could reflect executive misuse of firm resources. How effective are information intermediaries in enhancing the credibility of compensation contracts? Hartzell and Starks (2003) provide evidence that larger institutional investor oversight increases the fraction of equity compensation in total annual compensation. Besides institutional investors, analysts who monitor management decisions are important information intermediaries. I apply the same argument as Hartzell and Starks (2003), that financial analysts, as information intermediaries, affect the optimal compensation contract.

Financial analysts collect information from public and private sources, and participate in the information distribution process. Academic studies focus on

information provided to investors from two summary measures produced by analysts, earnings forecasts and coverage. Overall, the evidence indicates that financial analysts add value in the capital market. Healy and Palepu (2001) suggest that information intermediaries such as analysts engage in private information production that helps to detect managers' misbehavior. Compared with traditional types of governance devices, analysts possess several different characteristics that could make them effective monitors of managerial decision making. First, unlike internal governance devices designed to protect current shareholders interests, analysts are expected to provide information in the interest of not only current shareholders but also prospective shareholders as well as other participants in the market. Second, analysts usually have professional knowledge of finance and accounting related to the industries they cover. Therefore, I expect that analysts' actions can convey information about optimal compensation contracts that could mitigate agency costs between managers and all shareholders. Because analysts have distinctive features that are different from traditional internal governance devices, analysts' activities monitor CEO compensation contract differently than other internal governance mechanisms.

Three hypotheses describe the relationship between governance and compensation contracts. Under the entrenchment hypothesis,[6] an entrenchment environment makes it more difficult for stockholders to fire CEOs when CEO decisions serve their own rather than shareholder interest. Since risk-averse CEOs will reduce their own risks generated from the firm's stock price through decreases in the equity they hold (stock or options), this hypothesis predicts that firms with weaker corporate governance will have a lower CEO pay-for-performance sensitivity. On the other hand, an entrenched CEO who could potentially dominant the board, either through being both board chair and CEO, or through affecting the selection of compensation committee's members, could influence the decisions of the compensation subcommittee. Thus, CEOs obtain excess total compensation from the firm (e.g., Core et al., 1999). Therefore, the entrenchment hypothesis predicts a positive (negative) relationship between governance mechanisms (managerial entrenchment) and CEO pay-for-performance sensitivity, but a negative (positive) relationship between governance mechanisms (managerial entrenchment) and compensation level.

The complementarity hypothesis predicts that the quality of governance mechanisms is positively associated with pay-for-performance. When a firm's CEO activities can be monitored by an active role such as the board of directors, the firm may establish a compensation contract that is more profitable. While CEOs will

[6] See Bebchuk and Fried (2004).

participate in the capital gains through the exercise of stock options, they require a higher level of compensation since they bear more firm-specific risk through their increased pay-for-performance sensitivity. Although Bergstresser and Philippon (2006) find a positive relationship between stock-based compensation and earnings management, the possibility of earnings management through high pay-for-performance sensitivity is reduced because of the good governance mechanisms. That is, the governance monitoring, in general, can be used in concert with incentive compensation to mitigate the agency problem between stockholders and CEOs. This hypothesis thus suggests that firms with stronger governance have higher overall pay-for-performance sensitivity and a higher level of compensation.

The substitution hypothesis predicts the quality of governance mechanisms is negatively associated with pay-for-performance. The major purpose of optimal compensation structure is to eliminate the agency problem. If different governance mechanisms act as perfect substitutes for optimal compensation structure and reduce the agency problem, the risk taken by the CEO is fixed. Thus, there is no need to pay additional compensation for risk.

Table 1 Summary of Empirical Predictions between Stronger Governance and CEO Compensation

Hypothesis	Pay-for-Performance Sensitivity	Total Compensation
Substitution	–	–
Entrenchment	+	–
Complementarity	+	+

Table 1 (Fahlenbrach (2009)) summarizes the empirical predictions of the three hypotheses. While both the complementarity and entrenchment hypotheses predict a positive correlation between the quality of governance and the CEO pay-for-performance, the predicted sign differs for the correlation with the quality of governance and the level of CEO compensation. Under the substitution hypothesis, the stronger the governance mechanism, the lower the pay-for-performance sensitivity and total compensation.

Analysts not only facilitate information distribution but also produce firm-specific information. The existing literature suggests that the more analyst coverage leads to a better information environment and lower information asymmetry between insiders and outsiders (Bushman and Smith, 2001; Healy and Palepu, 2001). Yu (2008) finds that firms with more analysts following them have less earnings management. This

result highlights a direct reduction in asymmetric information through analyst action. The purpose of optimal compensation structures is also to reduce the agency problem generated from information asymmetries. Therefore, I predict that the monitoring role of analysts tends work in concert with compensation contracts in mitigating the agency problem generated by information asymmetries between CEO and shareholders. Based on three hypotheses in relation to compensation and governance, in which the predicted sign for the pay-for-performance sensitivity and total compensation differs, I propose:

H_1: Increasing analyst coverage is associated with CEO pay-for-performance sensitivities.

H_2: Analyst coverage is associated with CEO total compensation and excess compensation.

3. Methodology

3.1 Sample Selection

The major population for this study is publicly traded corporations of the S&P 1500, including the S&P 500, S&P MidCap 400, and S&P SmallCap 600. In order to collect sufficient data and consider the size effect due to the onerous nature of the data collection, the initial sample includes all S&P 1500 firm-years with data on CEO compensation available from Standard & Poor's Execucomp database, along with the proxy statements of these firms[7] over the period 2000-2006. I delete firms in the financial industry. My data source for analyst forecasts comes from I/B/E/S. I extract institutional ownership information and G_index from CDA/Spectrum Institutional 13(f) filings and IRRC Database, respectively. Finally, other control variables come from the Compustate Database, while the stock price data and capitalization comes from CRSP. My final observations comprise 5,383 firm-years.

3.2 Variables Definitions

3.2.1 Analysts Activities

This paper uses the analyst coverage to define the activities of analysts. I measure analyst coverage[8] by the log of the average number of analysts who made forecasts on a firm's earnings in any given year. and analyst forecast data available from I/B/E/S.

[7] If a firm's compensation data is not available on Execucomp, I extract it from its proxy statement.
[8] I do not delete firm observations with less than three covering analysts, as firms covered by very few analysts may be those that have the poorest information environment and governance mechanisms.

3.2.2 CEO Compensation Structure

(1) Pay-for-Performance Sensitivity

The two measures, Delta and Vega, are closely tied to firm performance and are widely used in the literature. Delta[9] is measured as the change in the value of CEO's equity and option holdings in response to a one-percent change in the firm's stock price. Vega is measured as the change in the value of CEO's option holdings in response to a one-percent change in the firm's stock return volatility. I provide the detail of these estimations in Appendix A. Delta and Vega represent the slope and convexity, respectively, of the CEO wealth that is the function of performance (stock price). The slope is a measure of the linkage between CEO incentives and shareholder goals. As the slope increases, the CEO has more incentives to align with shareholder goals. However, steep slopes (high levels of Delta) are related to CEO risk-aversion. The convexity measures the risk-taking incentive generated by stock option grants. In order to mitigate managerial risk aversion, the firm can provide the manager with compensation that is a convex function of the firm's stock price. Vega can measure this effect. Guay (1999) argues that both the slope and the convexity of the CEO's wealth-performance relation need to be considered in constructing a compensation contract that can induce managers to make optimal investment and financing decisions.

(2) The Level of Compensation

Total CEO compensation is measured as the summation of salary, bonus, current stock and stock option grants, and other annual compensation such as life insurance benefits and country club memberships[10]. Cash compensation is measured as the summation of salary and bonus. Banker et al. (2009), Bulan et al. (2010), and Murphy (1999) consider the effect of cash compensation. Thus, about the level of compensation, I focus on total compensation and cash compensation. I construct two measures of excess compensation, excess total compensation and excess cash compensation, based on previous studies. Bizjak et al. (2007) and Fahlenbrach (2009) find industry associated with the level of executive compensation. I report industry-adjusted total compensation, which removes the logarithm of median total CEOs compensation for the same industry[11] from the logarithm of total CEO compensation. I also report industry-adjusted cash compensation, which removes the

[9] Similar to Bulan et al. (2010), the Delta of this paper is the sum of equity Delta and option Delta. The definition of option Delta is the same as Core and Guay (2002). I consider the effect of restricted stocks on Delta.

[10] This is the definition of TDC2 in Execucomp database.

[11] The same industry is defined by the first two-digit SIC code.

logarithm of median cash compensation of CEOs for the same industry from the logarithm of cash compensation of CEO. The excess total compensation is the industry-adjusted total compensation, while the excess cash compensation is the industry-adjusted cash compensation.

3.2.3 Proxies for Internal Corporate Governance

In the paper, I collect data for the two firm-specific dimensions of governance: monitoring by large institutional shareholders, and anti-takeover provisions (G_index).

(1) Institutional Ownership Concentration

Institutional investors would be expected to have more influence when they are larger shareholders (e.g., Shleifer and Vishny (1986)) and when they have allies in the form of other shareholders (e.g., Black (1992)). I define institutional investor influence through the institutional ownership concentration measured as Herfindahal Index (Hartzell and Starks (2003)). I calculate each firm's Herfindahal Index of institutional ownership concentration year by year.

(2) Anti-takeover Provisions (G_index)

Using the incidence of 24 governance rules, Gompers et al. (2003) construct a "Governance Index (G_index)" to proxy for the level of shareholder rights for roughly 1,500 large firms during the 1990s. This index can measure the overall balance between shareholder and management rights. Some of the components of the index evaluate the effectiveness with which managers can resist hostile takeovers (e.g., poison pills, classified boards, directors' duties); others represent liability protection (e.g., indemnification contracts, limited liability provisions); and remaining items provide severance protection for managers or directors. The higher the G_index, the lower the quality of internal corporate governance.

3.2.4 Other Variables

In addition to my measures of pay-for-performance sensitivity, excess compensation and variable proxies for analyst activities, I use several independent variables as control variables. Based on the literature (e.g., Aggarwal and Samwick, 1999; Bulan et al. 2010; Cole, Daniel, and Naveen, 2008; Core and Guay, 1999; Demsetz and Lehn, 1985; Fahlenbrach, 2009; Hartzell and Starks, 2003; Himmelberg et al., 1999; Smith and Watts, 1992), these variables are assumed to capture the environment in which the firm operates and the scope of its managers' discretion. Control variables used in this study include firm size, R&D ratio, leverage, return on

assets, firm age, and dummy variable of high-tech industry. I use the logarithm of market capitalization as a measure of firm size. R&D ratio is the R&D expenses divided by total sales. Leverage is defined as the total debt divided by total assets. Return on Assets is defined as EBITDA divided by total assets. I use the 3-digit SIC codes to define high-tech industries. This dummy variable equals to 1, if 3-digit SIC codes belong to 272, 283, 355,357, 360 - 369, 381, 382, 481, 484, 489, 573, 737, and 873, and 0 otherwise.

3.3 Empirical Models

Most of the literature on the determinants of the level of compensation and pay-for-performance sensitivity uses the following model. The substantial skewness of the dependent variables (such as total cash compensation, adjusted-adjusted cash compensation, total compensation, and adjusted-adjusted total compensation) is accounted for by taking logarithms of those variables. I estimate two different regression models. First, I use a two-way fixed-effect regression model with both year and industry dummy variables. The two-way fixed-effect model assumes that unobservable firm-specific factors are reasonably well captured by the industry affiliation and time series. This yields the following regression model:

$$COM_{it} = \alpha + \sum_{j=1}^{J-1} \omega_j D_{ijt} + \sum_{t=t_0}^{T-1} \psi_t Y_t + \beta A_{it}^T + \gamma X_{it}^T + \varepsilon_{it} \cdots\cdots\cdots (1)$$

where i = 1, . . . , N is a firm index, t = 1, . . . , T is a year index, COM_{it} is the observed compensation variable including in Delta, Vega, the logarithm of total cash compensation, the logarithm of adjusted cash compensation, the logarithm of total compensation, and the logarithm of adjusted total compensation, α_i is a firm-specific and time invariant constant, A_{it} is a vector of firm-specific analysts coverage, X_{it} is a vector of firm-specific control variables related to the compensation variable, ω_j is the coefficient of industry j that measure the industry effect relative to the benchmark industry j, D_{ijt} is a dummy variable which equals to one if firm i at time t belongs to industry j and zero otherwise, ψ_t is the coefficient of year t that measure the time effect relative to the benchmark year t, and Y_t equals to one if the observation comes from year t and zero otherwise. I expect the firm-level observations across years to be correlated.

One important concern for the OLS test is the endogeneity problem of analyst coverage (Lognum), which may be affected by the information environment. Bhushan (1989), and Bushman et al. (2005) find that analysts tend to cover firms with a better information environment. Lang and Lundholm (1996), and Healy, Hutton, and Palepu (1999) suggest that firms with higher ratings of voluntary disclosure are likely to have more covering analysts. Yu (2008) suggest that analyst coverage is endogenous and may depend on leverage, stock return volatility, or firm performance. The influence of analysts' coverage could occur indirectly through their activities as well as through direct pressure. In order to resolve the endogeneity problem, I use the two-stage least squared analysis (2SLS) test, adopting instruments to capture the variations in analyst coverage that are exogenous to analysts' self selection behavior. I use an instrumental variable approach in which I run a two-stage least squared analysis. Further details on the measurement of these variables are presented in sections 4.2.3 and 4.3.3. Accordingly, in the first stage, I regress analysts' coverage on these instrumental variables. In the second stage, I run analyses of Delta, Vega, and compensation level using fitted values from the first stage regression as my instrument for coverage. In order to avoid the industry and time effect, I use equation (1), a two-way fixed-effect model, to run the regression in the second stage.

4. Empirical Results

4.1 Summary Statistics

Descriptive statistics on the principal variables of interest are given in Table 2. Panel A shows summary statistics of the compensation variables for the entire sample and across years. Cash compensation increases from 2003 to 2005. The increasing pattern of total compensation is similar to that of cash compensation. Total compensation in 2006 is highest, but the cash compensation is lowest, implying that there is a magic increase in incentive compensation (stock and stock options) in 2006. With regards to Delta, a one percent increase in the firm's stock price results in a median increase in CEO wealth of $153,894, while the mean increase is $349,315. This distribution is heavily skewed since the mean is significantly higher than the median. The pattern for Vega is similar to that of Delta. According to Vega, a one percent increase in the volatility of a firm's stock return corresponds to a median (mean) increase in CEO wealth of $151,468 ($321,289).

Panel B presents summary statistics on the analysts coverage and on the firm characteristics used as major control variables in the regressions. This Panel contains cross-sectional means, medians, Q_1s, and Q_2s of firm time-series average. According

to important variables, the mean number of analysts' coverage per year is 11.0038. Firm size, which is the logarithm of the mean market value of equity is 7.6131, is 195.78 million, suggesting that my sample includes large and small firms. The five largest institutional shareholders hold 37.32% of all institutional holdings while the average Herfindahl index is 0.0466. The average value of G_index equals 9.367. This means that my sample contains both low-entrenchment and high-entrenchment firms.

[Insert Table 2]

Table 3 shows correlation coefficients for the compensation variables and analysts' activities as well as for other control variables. As expected, the compensation variables have predicted signs and are significantly correlated with analyst coverage in many cases. For example, Delta, Vega, cash compensation and total compensation are positively correlated with analyst coverage ($p < 0.001$). According to correlations between compensation variables and control variables, the correlation coefficients of size and coverage are the largest. Therefore, it is evident that size and coverage are important determinants of CEO compensation. These results support my hypothesis that analysts' activities are associated with CEO compensation. Except for the correlation coefficients of the compensation variables for each other, all coefficients are less than 0.5.

[Insert Table 3]

4.2 Analysts Coverage and Compensation

4.2.1 Delta and Vega

In this section, I examine the relation between analyst coverage and CEO compensation sensitivities, Delta and Vega. Columns (1) and (2) in Panel A of Table 4 show the results. I find that the coverage is positively and significantly related to pay-for-performance sensitivities, with an economically large effect. More precisely, the coefficients of coverage on regressions of Delta and Vega are 0.0161 and 0.0257, respectively. A one standard deviation increase in the number of analysts coverage results in an 11.28% higher Delta, and an 18% higher Vega. If analysts play an external monitoring role and influence a firm's governance, these results are consistent with the prediction of H_1. Based on the entrenchment and complementarity hypothesis, the more the analyst coverage, the higher the pay-for-performance sensitivities. Results from this table in columns (5) and (6), the analysis of total compensation, can help distinguish between the two hypotheses.

In addition to the effect of coverage, I shed some light on the effect of institutional ownership on pay-for-performance sensitivities, controlling for coverage and other related variables. According to the regressions on Delta and Vega, the coefficients of institutional ownership concentration[12] are -1.4562 and -1.8392, respectively. These economic effects appear large: a one standard deviation increase in institutional ownership concentration would decrease the Delta and Vega by approximately 36.8% and 46.5%, respectively. These results are consistent with the prediction of the substitution hypothesis, that firms with stronger corporate governance (more institutional ownership concentration) have lower CEO pay-for-performance sensitivities. Findings related to institutional ownership are consistent with Fahlenbrach (2009), but inconsistent with Hartzell and Starks (2003). Two possible explanations are offered. First, because my sample period is similar to the sample period of Fahlenbrach (2009)[13], my results may be similar to those of Fahlenbrach. Second, Fahlenbrach (2009) and I study the overall Delta, while Hartzell and Starks (2003) study only the Delta of new equity grants.

Analysts serving a monitoring role are similar to institutional investors, but there is a difference in their effect on compensation. Since investors pay more attention to stocks that are in the news and to analysts' reports, increased analyst coverage is likely to have an incremental price effect by raising investor awareness and consequently the stock's investor base (Merton, 1987). Chung and Jo (1996) predict that security analyst monitoring of firm performance motivates managers to maximize their firms' value, thus reducing the agency costs associated with information asymmetry between insiders and outsiders. They also argue that the information provided by security analysts helps expand investor cognizance and perception. Based on these conjectures, they find that analyst coverage has a significant and positive impact on firm market value. Hence, a firm's value is positively related to its stock price. The more the analyst coverage, the higher the stock price, and the higher values of stock and stock options. The effect of stock and stock options on CEO pay-for-performance sensitivities for firms with more coverage is stronger than for firms with less coverage. On the other hand, Shleifer and Vishny (1986), Maug (1998), and Kahn and Winton (1998) argue that some institutions might focus on information gathering and trading, choosing not to expend effort on influencing management[14].

[12] This paper uses the Herfindahll index to measure the concentration of institutional ownership.

[13] The sample period of Fahlenbrach (2009) is from 1993 to 2004, while the sample period of Hartzell and Starks (2003) is from 1992 to 1997. My sample period is from 2000 to 2006.

[14] Empirical work has been mixed on the benefits of institutional ownership in a firm. Brickley, Lease, and Smith (1988), Agrawal and Mandelker (1990), Bushee (1998), Hartzell and Starks (2003), Almazan, Hartzell, and Starks (2005), and Borokhovich, Brunarski, Harman, and Parrino (2006), find

Chen et al. (2007) show that independent institutions with long-term investments will specialize in more monitoring and influencing efforts rather than in trading. Other institutions will not monitor. Due to the difference in monitoring effect between analysts and institutional investors, the results of institutional ownership support the substitution hypothesis, while those of analysts' coverage support the complementary or entrenchment hypothesis. Liungqvist et al. (2004) and Cowen et al. (2006) find that analysts' recommendations are less optimistic for stocks with heavy institutional ownership. Under their empirical results, firms with less analyst coverage have lower Delta and Vega, yet may have greater institutional ownership. This evidence can help explain the conflict in perceptions between analysts and institutional investors.

The positive coefficients and large t-statistics on firm size confirm the findings of previous studies (e.g., Core and Guay, 1999) that CEOs of large companies have a substantially higher dollar exposure to the stock price of their companies than do CEOs in smaller firms. The significant positive coefficients of return on assets suggest that good accounting performance be reflected in CEO's pay-for-performance. Coles et al. (2008) find that higher CEO Delta and Vega results in riskier firm policies (higher capital expenditures, higher R&D). The positive coefficients of the dummy variable of high-tech industries and R&D ratio for both Delta and Vega regressions are consistent with the argument of Coles et al. (2008).

4.2.2 The Level of Compensation

In this section, I examine the relation between analysts' coverage and the CEO compensation levels. Columns (3) to (6) in Panel A of Table 4 show the results. Other things being equal, the coefficients of coverage on regressions of total compensation and excess total compensation (industry-adjusted total compensation) are 0.0059 and 0.0099, respectively, meaning that a one-standard-deviation increase in the number of analysts covering a given firm means 4.13% higher total compensation, and 6.94% higher excess total compensation (industry-adjusted total compensation). These results are consistent with the prediction of H_2 that analyst coverage is associated with the level of excess total compensation. Recall that of the three hypotheses related to compensation (Table 1) that only the complementarity hypothesis predicts that firms with stronger governance characteristics pay their CEOs more. Thus, the results of Table 4 related to the total compensation are consistent with the complementarity hypothesis. Recall from Columns (1) to (2) that the coefficients of coverage are positive consistent with either the entrenchment or complementarity hypothesis in the

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that certain types of, but not all, institutional investors exert influence on antitakeover amendments, R&D investment decisions and CEO compensation.

pay-for-performance, while the coefficients of coverage from Columns (5) to (6) are negative consistent with the complementarity hypothesis. In sum, the complementarity hypothesis explains the effect of coverage on pay-for-performance sensitivities and level of compensation. Since incentive compensation can align managers' and stockholders' interests, the incentive structure imposes a cost on shareholders. At the same time, incentive compensation also imposes excessive risk on managers, while they are paid more than would otherwise be optimal. How can this conflict be resolved? Holmstrom and Tirole (1993), Burkart et al. (1997), and Chidambaran and John (1999) suggest interaction between the monitoring of managers and incentive compensation, where the monitoring is by the stock market, outside equity holders, and institutional investors. Both practitioners and scholars suggest that information intermediaries such as analysts engage in private information production that helps to detect managerial misbehavior. Therefore, this paper uses analysts as monitors of the stock market. Under the complementarity hypothesis, stronger governance mechanisms may be associated with higher pay-for-performance, because establishing pay-for-performance may require an active role by monitors. If CEOs are monitored as they approve risky projects that may maximize shareholder wealth, then CEOs would require a higher level of compensation due to their bearing more firm-specific risk and higher possibility of job loss. The results of Panel A in Table 4 indicate that analysts monitor the firm and help it establish an optimal compensation contract.

Columns (3) and (4) in Panel A show that the coefficients of cash compensation and excess cash compensation (industry-adjusted cash compensation) are negative, inconsistent with the results of total compensation. This finding appears to suggest that cash compensation is negatively related to coverage. However, in the next sub-section, when I address the endogeneity problem of analyst coverage, results will be different.

The coefficients of institutional ownership concentration from columns (3) to (6) are negative and significant. Since institutional ownership serves as a proxy for internal governance, the negative coefficients of institutional ownership concentration support the substitution or entrenchment hypothesis. Recall from Columns (1) to (2) that the coefficients of institutional ownership concentration are negative, consistent with the substitution hypothesis. To summarize Columns (1) to (6) may be explained by the substitution hypothesis, which explains the effect of institutional ownership concentration on pay-for-performance sensitivities and level of compensation. Based on this hypothesis, a firm with less monitoring by institutional investors tends to give

more power to the CEO to align the CEO's interests with those of other stockholders, and tends to have greater CEO pay-for-performance sensitivities and compensation levels. These findings related to institutional ownership concentration are consistent with those of Fahlenbrach (2009).

The coefficients on the control variables have signs and magnitudes largely consistent with prior studies. For example, firm size has positive coefficients and large t-statistics, consistent with previous studies on executive compensation (Murphy, 1985; Smith and Watts, 1992; Core et al., 1999). Firms with better performance pay their CEOs significantly more. The contemporaneous return on assets has a positively significant impact on CEO compensation. The coefficients of dummy variable of high tech industry for cash compensation regression and adjusted cash compensation regression are negatively significant, while those for Delta regression and Vega regression are positively significant. This implies that stock options appear to serve as substitutes for cash salary to compensate CEOs of firms in high-tech industries.

4.2.3 The Endogeneity of Coverage

One immediate concern for the previous test is the endogeneity of analyst coverage. The adoption of certain compensation structure by firms to attract analysts to cover these firms causes an endogeneity in the relation between analyst coverage and CEO compensation. To determine whether our results for analysts coverage hold in the face of endogeneity, I use the 2SLS test adopting instrument variables to capture the variations in analyst coverage that are exogenous to The firm's compensation structure. Analyst coverage has been found to be related to factors such as firm size, past performance, growth, external financing activities, and volatility of business (Bhushan, 1989; Dechow and Dichev, 2002; Kasznik, 1999; Yu, 2008).

Accordingly, in the first stage, I regress analyst coverage on instrumental variables including size, past performance, MB ratio, leverage and volatility of business [15] as controls. In the second stage, I run fixed-effect models using the fitted values from the first stage regression as our instrument for analyst coverage. The results are shown in Panel B of Table 4. The coefficients of coverage on the regressions of Delta and Vega are 0.0542 and 0.0689, respectively. Thus, a one standard deviation increase in the

[15] Firm size is measured as the natural log of firm's market value of equity at the end of firm's fiscal year. Past performance (ROA) is measured by lagged return on assets. MB ratio is measured as market value of equity divided by book value of equity. External financing activities are measured as leverage ratio that is net cash proceeds from debt financing scaled by total assets. Volatility of business is measured as the standard deviation of cash flows over the previous five years.

predicted coverage generated from the first stage[16] means 24.65% higher Delta, and 31.33% higher Vega. Similarly, the coefficients of coverage on the regressions of total compensation and excess total compensation (industry-adjusted total compensation) are 0.1380 and 0.1274, respectively. A one standard deviation increase in the predicted coverage generated from the first stage means 62.75% higher total compensation, and 57.94% higher excess total compensation (industry-adjusted total compensation).

In particular, the coefficients of cash compensation and excess cash compensation (industry-adjusted cash compensation) are statistically significant and negative when I address the endogeneity of analysts' coverage. This result in Panel B is the opposite of the results shown in Panel A, but is consistent with the complementarity hypothesis. Except for the coefficients of cash compensation and excess cash compensation (industry-adjusted cash compensation), the coefficients of other variables from 2SLS regressions are similar in magnitude and sign to those from the OLS regressions in Panel A of Table 4. Overall, it suggests that analyst coverage is positively related to CEO pay-for-performance sensitivities and level of compensation.

[Insert Table 4]

4.3 The Effect of G_index

The entrenchment hypothesis has recently been discussed from several perspectives. The entrenchment hypothesis starts with the assumption of a governance environment in which stockholders cannot fire the CEO. Suppose a company has a weak board of directors and strong anti takeover provisions in its corporate charter, causing senior managers to feel that there is little chance that they will be turned out. Such a company faces a high risk of being poorly run, because entrenched managers are able to act in their own interests rather than in those of shareholders. Therefore, the entrenchment hypothesis predicts that firms with weaker corporate governance will have a lower CEO pay-for-performance sensitivity because risk-averse managers will seek to reduce their exposure to the firm's stock price by holding less equity (stock or options). The entrenchment hypothesis exists if only if entrenched managers can influence the level of their annual total compensation and thereby extract excess total compensation from the firm (e.g., Core et al., 1999). In this section, I will discuss the effect of analyst coverage on compensation structure controlling for managerial entrenchment.

[16] The standard deviation of predicted coverage fitted by the first stage is 4.5477.

Gompers et al. (2003) construct a corporate governance index (G_index) to proxy for the level of shareholder rights. This index incorporates 24 issues associated with hostile takeovers. This paper also uses the G_index to proxy for the level of entrenched management. Based on this measure, the larger the G_index, the more entrenched the management is, and the weaker the governance mechanisms are. In order to avoid the correlation between institution ownership and G_index, I run all regressions using the G_index as a substitute for the Herfindahl Index of institutional ownership[17].

The results are shown in Table 5. Because there are some firms without G_index date, the final observations used for the analysis in Table 5 comprise 5,337 firm-years. To address endogeneity concerns, I employ a 2SLS model. The impact of coverage on compensation structure is found in Panel A. The coefficients of coverage in the regressions of pay-for-performance sensitivities (columns (1) to (2)) and levels of compensation (columns (3) to (6)) are positive and highly significant, suggesting the complementarity hypothesis explains the effect of coverage on pay-for-performance sensitivities and level of compensation. A comparison of the results without controlling for G_index in Panel B of Table 4 to those controlling for G_index in Panel A of Table 5 shows there is no difference in signs and magnitudes of coefficients of coverage across regressions. In sum, even after consideration of the level of managerial entrenchment, the effects of coverage on CEO compensation exist.

For the G_index, the results of the regressions controlling for coverage and other variables are shown Panel A. The coefficients on the regressions of Delta and Vega are -0.0174 and -0.0202, respectively. Hence, a one standard deviation increase in the G_index[18] means 4.3% lower Delta, and 5% lower Vega. A higher G_index represents falling quality of corporate governance, while the G_index is positively related to the level of entrenched management. This evidence is consistent with the entrenchment hypothesis. In addition, the coefficients of the G_index on the regressions of total compensation and excess total compensation (industry-adjusted total compensation) are 0.0215 and 0.0210, respectively. A one-standard-deviation increase in the G_index means 5.3% higher total compensation, and 5.2% higher excess total compensation (industry-adjusted total compensation). This evidence is also consistent with the entrenchment hypothesis. Thus, the entrenchment hypothesis

[17] Even if the regressions include the variable of institutional ownership, the pattern and sign of all coefficients are not changed. My results are not sensitive to different control variables related to internal corporate governance.

[18] The standard deviation of G_index is 2.4816.

explains the effect of G_index on CEO compensation structure. Firms with weaker internal corporate governance (higher G_index) will have lower CEO pay-for-performance sensitivities due to the CEO's risk aversion and higher total compensation due to CEO's influence on compensation decisions.

[Insert Table 5]

To combine with the results from analysts' actions and G_index to generate a conclusion, firms with stronger governance, measured by coverage and G_index, are required to establish the higher pay-for-performance sensitivities (Delta and Vega). But the relationship between total compensation and governance varies with the different proxy variables for governance.

4.4 Comparison among Governance Mechanisms

These results of this paper support the hypothesis that analysts play a monitoring role that affects CEO pay-for-performance sensitivity and total compensation. In addition, internal governance also has a monitoring function. Due to the diversity in firm' informational and competitive environments, combined with the fact that governance mechanisms have costs; there may be cases in which different governance mechanisms have different effects on compensation structure. Hence, I will discuss the effect on compensation structure for firms with heavy use of one mechanism but not the other.

I compare the effect of analysts' coverage with the effect of entrenched provisions (G_index). Gompers et al. (2003) divide the sample into ten portfolios based on the level of G_index. The Democracy Portfolio is composed of all firms where G <= 5, and the Dictatorship Portfolio contains all firms where G >= 14. Hence, similar to Gompers et al., I divided the sample firms for each year into three groups, based on G_index. Firms in the Dictatorship group (G >= 14) have the weakest shareholder rights and strongest managerial entrenchment, while firms in the Democracy group (G <= 5) have the strongest shareholder rights and weakest managerial entrenchment. I next divide the firms for each year into three quartiles[19] according to their analyst coverage and define high (low) coverage firms as those with coverage in the highest (lowest) quartile.

According to these definitions, I have 109 observations in the Dictatorship (G >=

[19] In order to matching with the classification of G_index, the sample is segmented into three groups based on coverage and forecast error.

14)/high coverage, and 144 observations in the Democracy (G <= 5)/low coverage. Table 6 provides the pay-for-performance sensitivities and level of compensation of firms in the two extreme groups, along with the Wilcoxon Z statistics and t statistics for tests of difference between two groups classified by G_index and coverage.

On average, firms in the Dictatorship/high coverage group tend to have higher pay-for-performance sensitivities and higher level of compensation than their counterparts in the Democracy/low coverage group. Based on the entrenchment hypothesis, the CEOs of firms with higher managerial entrenchment (higher G_index) have lower pay-for-performance sensitivities than those of firms with lower managerial entrenchment (lower G_index). Thus, if managerial entrenchment affects the CEO pay-for-performance sensitivities, the firms in the Dictatorship group would have lower pay-for-performance sensitivities than their counterparts in the Democracy group. On the other hand, based on the complementarity hypothesis, the CEOs of firms with greater analyst coverage have higher pay-for-performance sensitivities than those of firms with lower analyst coverage. Thus, if analyst coverage affects the CEO pay-for-performance sensitivities, firms in the high coverage group would have higher pay-for-performance sensitivities than their counterparts in the low coverage group. In other words, firms in the Dictatorship/high coverage group would have lower CEO pay-for-performance sensitivities than their counterparts in the Democracy/low coverage group, if the effect of coverage is dominated by the effect of managerial entrenchment. By contrast, the firms in the Dictatorship /high coverage group tend to have higher CEO pay-for-performance sensitivities than their counterparts in the Democracy/low coverage group, if the effect of managerial entrenchment is dominated by the effect of coverage. In Table 6, the differences in pay-for-performance sensitivities between two groups, column (1) – column (2), are positive and significant, providing support for the assertion that the effect of coverage dominates the effect of managerial entrenchment.

For total compensation, analyst coverage is positively related to the level of total compensation based on the complementarity hypothesis, while managerial entrenchment (G_index) is positively (negatively) related to the level of total compensation based on entrenchment hypothesis. Therefore, if managerial entrenchment may effectively affect the CEO's total compensation, firms in the Dictatorship group tend to have higher total compensation than their counterparts in the Democracy group. On the other hand, based on the complementarity hypothesis, the CEOs of firms with greater analyst coverage have higher total compensation than those of firms with lower analyst coverage. In sum, firms in the Dictatorship/high

coverage group tend to have higher total CEO compensation than their counterparts in the Democracy/low coverage group, if both hypotheses are supported. In Table 6, the differences in total compensation and excess total compensation (industry-adjusted total compensation) between two groups, column (1) – column (2), are positive and significant, consistent with predictions of the two hypotheses.

[Insert Table 6]

5. Conclusion

There is much interest in the effect of CEO's equity-linked compensation. While incentive compensation better aligns the interests of managers and stockholders, the incentive structure imposes a cost on shareholders. From the standpoint of the rational investor, how a firm designs an option-based executive compensation plan that can eliminate disadvantages and foster advantages is quite important. The existing literature suggests that the monitoring function of governance is linked to compensation structures. This paper explores the role of external governance, investigating the effect of analyst coverage on compensation structures, including pay-for-performance sensitivities (Delta and Vega) and total compensation.

I offer three main results. First, I find that analyst coverage is positively related to CEO pay-for-performance sensitivities and level of compensation. Even after addressing the endogeneity of analyst coverage, this result still exists. This evidence supports the complementarity hypothesis. Both practitioners and theoreticians suggest that information intermediaries such as analysts engage in private information production that helps to detect managerial misbehavior. Under the complementarity hypothesis, stronger governance mechanisms may be associated with higher pay-for-performance, because establishing pay-for-performance may require an active monitoring by external observers such as analysts.

Second, the entrenchment hypothesis explains the effect of G_index on CEO compensation structure. Firms with weaker internal corporate governance (higher G_index) will have lower CEO pay-for-performance sensitivities due to the CEO's risk aversion and higher total compensation due to the CEO's influence on compensation decisions. Even when taking into consideration the level of managerial entrenchment, the effect of coverage on CEO compensation structure remains.

Third, I discuss the effect of governance on compensation structure for firms with heavy use of one governance mechanism but not the other. Firms in the Dictatorship

(G>=14)/high coverage group tend to have higher pay-for-performance sensitivities and higher level of compensation than their counterparts in the Democracy (G<=5)/low coverage group. These results indicate that the effect of coverage dominates the effect of managerial entrenchment.

Appendix

CEO Delta=Equity Delta + Option Delta

$$Equity\ Delta = N_{OS} P * 0.01$$

N_{OS} *: the number of shares owned by CEO*

$$option\ Delta = \sum_{j=1}^{3} \left[\frac{\partial (option\ value_j)}{\partial (P)} \right] \times (P) \times 0.01$$

P : the stock price at the end of the fiscal year

$$option\ Velta = \sum_{j=1}^{3} \left[\frac{\partial (option\ value_j)}{\partial \sigma} \right] \times 0.01$$

j=1 New option grants
j=2 Exercisable option grants
j=3 Unexercisable option grants

Stock option value is calculated based on the Black-Scholes (1973) formula for valuing European call options, as modified to account for dividend payouts by Merton (1973).

$$\frac{\partial (option\ \ value)}{\partial (P)} = e^{-dt} N(Z)$$

$$\frac{\partial (option\ \ value)}{\partial (\ price)} = e^{-dt} N'(Z) ST^{(1/2)}$$

$N' = Normal\ Density\ Function$

where $Z = \left[ln(S/X) + T(r - d + (1/2)\sigma^2) \right] / \sigma T^{(1/2)}$, N is the cumulative probability function for the normal distribution, S the price of the underlying stock, X the exercise price of the option, σ the standard deviation of daily returns for the previous year, r the risk-free interest rate (treasury yield corresponding to time-to-maturity), T the time-to-maturity of the option in years, and d is the expected dividend rate over the life of the option.

I follow Core and Guay's (1999) methodology to estimate option values. Option grants are decomposed into new option grants and option grants in previous years. For new grants, the exercise price and time to maturity are taken from the proxy statement or Execucomp. For option grants in previous years, I perform the following process:

1. I need data on previously granted options including number of exercisable and unexercisable options outstanding and current realizable value of exercisable and unexercisable options. The number and realizable value of the unexercisable options is reduced by the number and realizable value of the current year's grant.
2. Current realizable value is used to estimate average exercise price of exercisable and unexercisable options. The average exercise price is estimated as [fiscal-year-end price–(realizable value/number of options)].
3. Assume that the time-to-maturity of unexercisable options is equal to one year less than the time-to-maturity of the most recent year's grant or nine years if no new grant was issued. On the other hand, assume that the time-to-maturity of exercisable options is equal to three years less than the time-to-maturity of unexercisable options or six years if no new grant was issued.

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Table 2 Summary Statistics

This table reports the sample statistics for the principal variables. Panel A shows the means and medians for all variables year by year. Panel B contains cross-sectional means, medians Q1s, Q3s, minimum, maximum, and standard deviations for all observations over the period 2000-2006. All variables are defined in Section 3.2 and Appendix.

Panel A: Compensation summary statistics

		Delta		Vega		Cash Compensation		Total Compensation	
Year	Observations	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2000	659	289.8791	68.2929	503.9223	147.9170	1,357.2329	1,062.8120	4,500.8628	1,798.7090
2001	761	225.6654	88.4619	412.1546	174.9067	1,286.9829	974.5780	4,188.7942	1,764.7050
2002	807	150.4574	59.1875	319.2517	141.7150	1,338.9291	1,080.4000	3,526.9950	1,737.5360
2003	861	261.7553	111.9338	365.0293	169.4105	1,478.6999	1,123.0000	4,622.0659	2,081.9990
2004	831	329.1684	149.6622	364.5617	177.5733	1,730.2074	1,362.5000	6,445.3107	2,784.5145
2005	816	344.5770	150.1137	326.8396	155.5963	1,830.4306	1,438.2290	6,698.7847	3,276.0230
2006	648	349.3145	153.8937	321.2888	151.4675	1,275.6325	918.6770	10,923.9368	4,017.3610
Average	5,383	277.0934	103.9484	370.8395	160.4055	1,482.9000	696.1000	5,590.2000	2,329.8000

Table 2 (Continued)

Panel B: Descriptive Statistics of major variables

Variables	Number of observations	Mean	Q_1	Median	Q_3	Minimum	Maximum	Standard deviation
Coverage	5,383	11.0038	5.5455	9.2727	14.9091	1.0000	43.9167	7.0037
Delta (thousands)	5,383	277.0934	35.7358	103.9484	273.6034	0.0000	16,938.6000	585.0832
Vega (thousands)	5,383	370.8395	63.1132	160.4055	382.0487	0.0000	28,922.9800	835.9688
Cash Compensation (millions)	5,383	1.4829	0.6961	1.1078	1.8670	0.0000	43.5115	1.5037
Adjusted Cash Compensation (millions)	5,383	0.1752	-0.2926	0.0003	0.4254	-3.2904	42.0580	1.3334
Total Compensation (millions)	5,383	5.5902	1.1156	2.3298	5.4383	0.0000	2,249.9988	33.5238
Adjusted Total Compensation (millions)	5,383	2.6432	-0.9482	-0.0582	1.7827	-14.3148	2,235.6839	33.3076
Return on Assets (IB)	5,383	0.0576	0.0264	0.0586	0.1047	-8.9072	0.8490	0.1701
Post Return on Assets (IB)	5,383	0.0608	0.0264	0.0593	0.1072	-8.9072	0.8674	0.1761
Log of Market value	5,383	7.6131	6.5590	7.4819	8.5269	3.3639	12.2969	1.4481
R&D Ratio	5,383	0.0543	0.0000	0.0016	0.0527	0.0000	7.1579	0.1889
Stock-Market Volatility	5,383	0.0261	0.0172	0.0230	0.0312	0.0068	0.1131	0.0130
Leverage	5,383	0.1906	0.0397	0.1816	0.2954	0.0000	1.0000	0.1593
Firm Age	5,383	25.5472	10.0000	18.0000	35.0000	1.00000	81.00000	20.4689
Dummy variable of high-tech industries	5,383	0.3088	0.0000	0.0000	1.0000	0.0000	1.0000	0.4621
Institution Ownership Concentration (Herfindahl Index)	5,383	0.0466	0.0315	0.0411	0.0543	0.0115	0.4084	0.0253
G_index	5,337	9.3670	8.0000	9.0000	11.0000	2.0000	17.0000	2.4816

Table 3 Correlation Coefficients of All Variables

This table contains cross-sectional Pearson correlation coefficients of compensation variables, coverage, Herfindahl-Index, GINDEX, and other control variables. The cross-sectional correlation coefficients are calculated from all observations over the period 2000-2006. All variables are defined in Section 3.2 and Appendix.

Variables	Delta	Vega	Cash Comp.	Adjusted Cash Comp.	Total Comp.	Adjusted Total Comp.	Coverage	ROA	Post ROA	Size	R&D Ratio	Stock Market Volatility	Leverage	Firm Age	High-Tech	Herfindahl Index	GINDEX
Delta	1.0000																
Vega	0.7931	1.0000															
Cash Comp.	0.3519	0.2882	1.0000														
Adjusted Cash Comp.	0.1675	0.1294	0.8885	1.0000													
Total Comp.	0.2301	0.2114	0.1271	0.0815	1.0000												
Adjusted Total Comp.	0.1910	0.1822	0.0939	0.0769	0.9965	1.0000											
Coverage	0.3880	0.3794	0.3152	0.0221	0.1201	0.0684	1.0000										
ROA	0.1094	0.0696	0.0919	0.0419	0.0386	0.0285	0.0725	1.0000									
Post ROA	0.1105	0.0801	0.0467	0.0082	0.0441	0.0390	0.0736	0.2274	1.0000								
Size	0.3375	0.3052	0.4589	0.1353	0.1199	0.0587	0.5805	0.0266	0.0137	1.0000							
R&D Ratio	0.0101	0.0350	-0.0746	-0.0665	-0.0010	0.0010	0.0314	-0.2128	-0.1381	-0.1308	1.0000						
Stock Market Volatility	-0.1183	0.0082	-0.2168	-0.0825	-0.0315	-0.0018	-0.0536	-0.2266	-0.1542	-0.3729	0.2427	1.0000					
Leverage	-0.0582	-0.0374	0.0505	0.0581	-0.0188	-0.0164	-0.0566	-0.1004	-0.1095	0.2669	-0.0359	-0.1032	1.0000				
Firm Age	0.0763	0.0694	0.2448	0.1020	0.0426	0.0131	0.1015	0.0249	0.0050	0.5070	-0.1216	-0.3372	0.1604	1.0000			
High-Tech	0.0780	0.1208	-0.0670	-0.0810	0.0366	0.0357	0.1299	-0.0969	-0.0770	-0.1367	0.3373	0.3699	-0.2198	-0.1956	1.0000		
Herfindahl Index	-0.1781	-0.1428	-0.1544	-0.0494	-0.0626	-0.0414	-0.2496	-0.1427	-0.0944	-0.1907	0.0630	0.1766	0.0900	-0.0795	-0.0318	1.0000	
G_index	-0.0498	-0.0367	0.0713	0.0444	0.0050	0.0013	-0.0308	0.0080	-0.0087	0.1692	-0.0818	-0.2147	0.1338	0.2660	-0.1318	-0.0570	1.0000

Table 4 Analysts Coverage and Compensation

This table shows the coefficients from regression of compensation variables on analyst coverage and other control variables. The dependent variable in column (1) is the logarithm of Delta measured as the change in the value of CEO's equity and option holdings in response to a one-percent change in the firm's stock price. The dependent variable in column (2) is the logarithm of Vega measured as the change in the value of CEO's option holdings in response to a one-percent change in the firm's stock return volatility. The dependent variable in column (3) is the logarithm of cash compensation measured as the summation of salary and bonus. The dependent variable in column (4) is the logarithm of excess cash compensation measured as the industry-adjusted cash compensation (the logarithm of cash compensation removes the logarithm of median cash compensation for the same industry). The dependent variable in column (5) is the logarithm of total compensation (Execucomp item TDC2). The dependent variable in column (6) is the logarithm of excess total compensation measured as the industry-adjusted total compensation (the logarithm of total compensation removes the logarithm of median total CEO compensation for the same industry). Coverage is calculated by the log of the average number of analysts who made forecasts on firm's earnings in any given year. Institution Ownership Concentration is measured as Herfindahl Index (Hartzell and Starks (2003)). Firm size is measured as logarithm of market capitalization. R&D ratio is measured as R&D expenses divided by total sales. Leverage is defined as the total debt divided by total assets. Return on Assets is defined as EBITDA divided by total assets. The dummy variable of High Tech Industry equals to 1, if 3-digit SIC codes belong to 272, 283, 355,357, 360–369, 381, 382, 481, 484, 489, 573, 737, and 873, and 0 otherwise. Panel A shows results of fixed-model. Panel B shows the two-stage least squared analysis (2SLS) using fitted values from the first stage regression as my instrument for coverage (Predicted Coverage).

Variables	Delta (1)	Vega (2)	Cash Compensation (3)	Excess Cash Compensation (4)	Total Compensation (5)	Excess Total Compensation (6)
Panel A: Fixed-Effect						
Intercept	-0.6125**	-1.0495***	4.9021***	-1.5861***	5.2142***	-2.1807***
	(-2.96)	(-3.48)	(14.72)	(-4.77)	(12.14)	(-5.10)
Coverage	0.0161***	0.0257***	-0.0055***	-0.0038***	0.0059*	0.0099***
	(10.13)	(11.11)	(-3.75)	(-2.59)	(2.09)	(3.49)
Institution Ownership Concentration	-1.4562***	-1.8392***	-2.2697***	-2.1541***	-4.5622***	-3.9774***
	(-4.80)	(-4.18)	(-4.69)	(-4.45)	(-7.31)	(-6.40)
Size	0.1156***	0.1467***	0.3096***	0.3021***	0.4017***	0.3814***
	(12.88)	(11.26)	(21.61)	(21.09)	(21.72)	(20.72)
R&D Ratio	0.0911*	0.1279*	0.0875	0.0817	0.2170*	0.2143*
	(2.10)	(2.03)	(1.25)	(1.17)	(2.41)	(2.39)
Leverage	-0.2035***	-0.2135**	0.0641	0.0826	-0.1428	-0.0720
	(-3.74)	(-2.71)	(0.74)	(0.96)	(-1.28)	(-0.65)
Return on Assets (IB)	0.2263***	0.2875***	0.2956***	0.2665***	0.6145***	0.5510***
	(5.07)	(4.43)	(4.12)	(3.72)	(6.65)	(5.99)
Firm-Age	-0.0016***	-0.0005	0.0017*	0.0018*	-0.0001	-0.0000
	(-3.53)	(-0.84)	(2.37)	(2.52)	(-0.08)	(-0.01)
High Tech Industry	0.0532*	0.0594	-0.1632***	-0.1625***	-0.0860	-0.0695
	(2.08)	(1.60)	(-3.97)	(-3.95)	(-1.62)	(-1.32)
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.2354	0.2046	0.2761	0.2221	0.3044	0.2476
Observations	5,383	5,383	5,383	5,383	5,383	5,383

Table 4 (Continued)

Variables	Delta (1)	Vega (2)	Cash Compensation (3)	Adjusted Cash Compensation (4)	Total Compensation (5)	Adjusted Total Compensation (6)
Panel B: Two-Stage						
Intercept	-0.5078*	-1.0316***	5.4301***	-1.1391***	6.2895***	-1.3741**
	(-2.39)	(-3.32)	(15.95)	(-3.88)	(14.15)	(-3.18)
Predicted Coverage	0.0542***	0.0689***	0.0288**	0.0302**	0.1380***	0.1274***
	(8.06)	(7.02)	(2.68)	(2.82)	(10.10)	(9.34)
Institution Ownership Concentration	-0.2454	-0.4239	-1.0761*	-1.1489*	-0.6127	-0.4801
	(-0.68)	(-0.81)	(-1.88)	(-2.00)	(-0.84)	(-0.66)
Size	0.0161	0.0405	0.1734***	0.1818***	0.0078	0.0362
	(0.76)	(1.31)	(5.15)	(5.38)	(0.18)	(0.84)
R&D Ratio	0.1049*	0.1588*	0.0286	-0.0294	0.1452	0.1318
	(2.41)	(2.50)	(0.41)	(-0.42)	(1.63)	(1.50)
Leverage	0.1737*	0.2344*	0.3908**	0.4169**	1.0394***	1.0073***
	(2.16)	(2.00)	(3.08)	(3.28)	(6.40)	(6.22)
Return on Assets (IB)	0.2187***	0.2883***	0.2457***	0.3094***	0.5174***	0.5095***
	(4.86)	(4.39)	(3.42)	(4.37)	(5.63)	(5.65)
Firm-Age	-0.0024***	-0.0019**	0.0023**	0.0029***	-0.0004	-0.0003
	(-5.47)	(-2.91)	(3.26)	(4.15)	(-0.48)	(-0.29)
High Tech Industry	0.0715**	0.0896*	-0.1752***	-0.1253***	-0.0801	-0.0865*
	(2.79)	(2.40)	(-4.28)	(-5.73)	(-1.53)	(-1.69)
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.2300	0.1938	0.2729	0.2126	0.3164	0.2571
Observations	5,383	5,383	5,383	5,383	5,383	5,383

Statistical significance at the 0.1%, 1%, and 10% level is indicated by ***, **, and *, respectively.

Table 5 A Further Test of G_index (Two-Stage Least Squared Analysis)

This table shows the coefficients from regression of compensation variables on analysts' coverage if G_index is used as an independent variable. Using the incidence of 24 governance rules, Gompers et al. (2003) construct a "Governance Index (G_index)" to proxy for the level of shareholder rights. The higher the G_index, the lower the quality of internal corporate governance is. This table shows the two-stage least squared analysis (2SLS) using fitted values from the first stage regression as my instrument for coverage (Predicted Coverage).

Variables	Delta	Vega	Cash Compensation	Excess Cash Compensation	Total Compensation	Excess Total Compensation
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.2955	-0.6470*	4.9678***	-1.5747***	6.0400***	-1.5888***
	(-1.38)	(-2.06)	(14.46)	(-4.59)	(13.79)	(-3.64)
Predicted Coverage	0.0563***	0.0685***	0.0460***	0.0424***	0.1446***	0.1326***
	(10.06)	(8.35)	(5.13)	(4.73)	(12.64)	(11.62)
G_index	-0.0174***	-0.0202***	0.0277***	0.0271***	0.0215***	0.0210***
	(-5.61)	(-4.45)	(5.57)	(5.45)	(3.39)	(3.33)
Size	0.0107	0.0322	0.1400***	0.1479***	-0.0114	0.0209
	(0.57)	(1.18)	(4.70)	(4.97)	(-0.30)	(0.55)
R&D Ratio	0.0940*	0.1857**	-0.0205	-0.0229	0.1458*	0.1428
	(2.18)	(2.94)	(-0.30)	(-0.33)	(1.65)	(1.62)
Leverage	0.2148**	0.2500*	0.5136***	0.4953***	1.0839***	1.0342***
	(2.87)	(2.28)	(4.32)	(4.17)	(7.14)	(6.83)
Return on Assets (IB)	0.2170***	0.2275***	0.3302***	0.3087***	0.5290***	0.5059***
	(4.91)	(3.51)	(4.66)	(4.36)	(5.86)	(5.62)
Firm-Age	-0.0020***	-0.0018**	0.0021**	0.0022**	-0.0008	-0.0007
	(-4.47)	(-2.70)	(2.97)	(3.09)	(-0.86)	(-0.76)
High Tech Industry	0.0675**	0.1239***	-0.2224***	-0.2221***	-0.0926*	-0.0889*
	(2.68)	(3.36)	(-5.51)	(-5.50)	(-1.80)	(-1.73)
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.2343	0.1925	0.2717	0.2175	0.3192	0.2594
Observations	5337	5337	5337	5337	5337	5337

Table 6 Extremes in The Interaction Effects between Analysts' Behaviors and G_index on Incentive Compensation

In the left side, this table presents summary statistics for a group of 109 (144) observations with high (low) G_index and high (low) coverage. High G_index/high coverage observations are defined as observations whose G_index is above 13 among all observations, with analysts' coverage in the lowest quartile. Low G_index/ low coverage observations are defined analogously (lowest G_index (G<=5), lowest coverage). The definitions of compensation variables and coverage are the same as those in Table 3 and Table 4.

	G_INDEX and Coverage					
	Dictatorship (G >= 14) / High Coverage (1)		Democracy (G <= 5) / Low Coverage (2)		Difference (3) (1)-(2)	
Variables	Median	Mean	Median	Mean	Wilcoxon Z	t-statistic
Delta	197.6605	289.2000	30.2966	70.2550	8.54***	6.62***
Vega	350.0038	518.1700	61.5880	136.1400	9.53***	5.59***
Cash Compensation	2,068.3800	2,341.7000	506.6665	661.8900	11.77***	13.87***
Adjusted Cash Compensation	985.4315	1,247.0000	-276.0220	-207.0000	11.27***	11.69***
Total Compensation	4,282.1900	6939.6000	706.8205	1,643.0000	10.51***	7.22***
Adjusted Total Compensation	2,187.9600	4562.6000	-662.1875	-59.8400	9.49***	6.52***
Observations	109		144			

Statistical significance at the 0.1%, 1%, and 10% level is indicated by ***, **, and *, respectively.