Managerial Ability and Compensation Design

Bae, Wonpyo
College of Business Administration
Seoul National University

Abstract

This research views the contingent terms in compensation as a tool for the compensation committee to capture the unknown managerial ability while it continues to serve as an incentive mechanism. As a specific mechanism that 'sorts' manages by their ability to help shareholders retain and attract CEO human capital, Lazear (2004) analyzes the role of contingent terms in compensation when managers are more informed about their productivity. Dutta (2008) suggests that the sensitivity of compensation to performance increases with the managerial ability particularly when information risk is higher. Following Lazear (2004) and Dutta (2008), I empirically investigate the association between the managerial ability and pay sensitivity. Using measure of managerial ability developed by Demerjian et al. (2012) and a sample from ExecuComp, I find that sensitivity of total flow compensation to stock return is increasing with CEO ability. I also find that this positive relationship between the CEO ability and the sensitivity is more salient when CEO is relatively younger, when book-to-market ratio is higher, when a firm has R&D spending, and when a firm is not included in S&P 500 index. I interpret that those four contexts reflect greater information asymmetry about the managerial ability and hence firms encounter greater needs of figuring out the manager's ability correctly. In additional tests, I examine the potential

effects of industry and time period on my main findings. I find that high technology firms make intensive use of the ability-sorting mechanism via incentive contracts, and that the results are stronger in recent periods suggesting that firms and shareholders' attention on managerial ability is growing in relation to the compensation strategy.

Keywords: *managerial ability, pay-for-performance, information asymmetry, menu of compensation contracts*

Data availability: *The data used in this study are publicly available.*

1. Introduction

A compensation committee must consider managerial talent and expertise for the shareholders' value maximization, and therefore, figure out the size of competitive pay that can attract or retain quality managers from the market. Nonetheless, there has been little attention paid to the value of management human capital and its implication on the design of incentive contracts in adverse selection contexts[1] [2]. The traditional executive compensation literature considers the incentive contracts as a way to address moral hazard issues. Most studies in management accounting and agency theory have investigated optimal compensation contracts that can effectively motivate managers while aligning their interests with the shareholders by means of contingent reward terms with altering incentive power (Jensen and Murphy 1990, Baker and Hall 2004, Frydman and Jenter 2010). This research views the contingent terms in

[1]There are studies that incorporate CEO ability not as a form private information, rather as a form of reputation. Milbourn (2003) studies the relation between stock-based pay sensitivities and CEO reputation. His claim is that if perception of CEO ability, or CEO reputation, is higher, then the CEO will be more likely to be retained in the future, thus the stock price reflects more future actions of current CEO and becomes more informational measure. His study links higher CEO reputation with better chance of retention, and assumes shareholders reflect this link to compensation contracts. In contrast to this, some studies assume that retention of talented managers is an objective for shareholders. Oyer (2004) is based on that assumption. According to his analysis, if managers' outside opportunities vary with general economy conditions, and if direct wage adjustments are costly, it is optimal not to filter out such uncontrollable portion of performance to retain more talented managers. Rajgopal et al. (2006) empirically tests hypothesis of Oyer(2004) using number of media mentions and past industry-adjusted ROA as a proxy for managerial ability.

[2]Armstron, Larcker and Su (2010) is an exception. They use simulation analysis which allows more realistic assumptions (e.g., constant relative risk aversion of agents, lognormal distribution of stock prices) to address both moral hazard and adverse selection problems. They assume that managers vary by their relative risk aversion and find that wealth effects have significant impacts both on incentive provision and screening manager heterogeneity.

compensation as a tool for the compensation committee to capture the unknown managerial ability while it continues to serve as an incentive mechanism.

The manager's human capital involves compensation contracts as the managerial ability is associated with the manager's reservation wage in the executive labor market. Hermanson et al. (2011) suggest, based on their interview with compensation committee members of multiple firms in various industries, that there exists a tension between demand for resource and managerial expertise versus potential overpayment arising from unobservable managerial ability. Given the information asymmetry on the manager human capital, the compensation committee needs to develop mechanisms to extract information about managers' human capital. As a specific mechanism that sorts manages by their ability to help shareholders retain and attract CEO human capital, Lazear (2004) analyzes the role of variable pay (contingent terms in compensation) when managers have superior information about their productivity. In such setting, he claims that shareholders have incentives to set sensitivity of compensation to firm profits higher to induce more productive managers. In a similar vein, Dutta (2008) shows that the positive relationship between sensitivity of compensation to performance measures and managerial ability holds only when managerial ability is sufficiently general and transferrable, and that the relationship is strengthened when information risk is higher.

I empirically examine predictions from Lazear (2004) and Dutta (2008),

using recently developed measure of managerial ability. Demerjian et al. (2012) introduce a measure of managerial ability that is designed to find manager-specific contribution to firm efficiency. I use this measure to devise a simple empirical design in context of CEO compensation. I hypothesize that when managers can select compensation contract terms with respect to the degree of incentive slope, more talented managers are likely to prefer high powered incentive terms as they should be more confident on high level of performance whereas less capable managers are likely to accept fixed-salary oriented compensation. Thus, I investigate whether compensation committees offer compensation contracts with different levels of sensitivity in pay-for-performance (i.e., incentive power) in order to sort their ability level. In addition, I examine circumstances where offering such menu of differential incentive power gets more meaningful. I hypothesize that the information asymmetry on the managerial ability is associated with CEO age, firm's growth opportunity, and the visibility of firms CEOs are working for. I expect that the value of managerial expertise to the firm is more difficult to discern when a CEO is young and less experienced, when the firm is exploiting large investment opportunities (higher environmental uncertainty), and when firms are smaller and their CEOs have yet been fully recognized in the executive market.

I examine my research questions using a sample from ExecuComp database over the 1993 – 2009 periods. The results are generally consistent with

my hypotheses. I find that sensitivity of compensation to performance measure is increasing in CEO ability, when compensation is defined as total flow compensation and performance measure is stock return. I also find that this practice of differentiating incentive power prevails under the greater information asymmetry. The positive relationship between the CEO ability and the sensitivity of total compensation to stock return is significant when CEO is relatively younger and when a firm is not included in S&P 500 index. However, contrary to our prediction, the positive relationship is only observed in firms with low growth opportunities, which are assumed to represent low information risk environment. In additional tests, I control the effect of investment sets on pay sensitivity and still find evidence for our main hypotheses. I also address effect of difference in generality of managerial ability on use of sorting. Based on prior studies, I assume generality of managerial ability is higher in recent periods or in high tech industries. I find that high technology firms show a pattern consistent with intensive use of sorting, and that evidence consistent with use of sorting is mostly found in recent periods, which are during 2001 and 2009.

Section 2 summarizes prior literature regarding managerial ability and pay-for-performance sensitivity, which leads to my hypotheses. Section 3 describes data and methodologies in our empirical design. Sections 4 and 5 present the empirical results from our main and additional tests, and Section 6 concludes the study.

2. Hypotheses Development

This study is motivated from two theoretical studies—Lazear (2004) and Dutta (2008). Lazear (2004) proposes that managers differ in two dimensions—their ability to affect firm's profit and their alternative employment opportunities. These two dimensions can be positively correlated but do not necessarily subsume each other. Although CEO human capital is very important to a firm's value creation, he might not have other job opportunities in case his expertise is firm-specific but not transferrable. Since managers differ in their external job opportunity sets as well as because their ability is private information, it is not possible to 'tailor' salary to managers' ability. However, exploiting pay-for-performance sensitivity can sort out managers in terms of their ability levels—more able managers have higher chance to make bigger profits and therefore they will be more likely to enter the contract with more variable portion of pay which is contingent on firm profits.

Dutta (2008) further develops Lazear (2004) into agency theory framework, where both ability and effort of managers affect firm value. Dutta (2008) theoretically shows that the positive association will only appear when managerial ability is sufficiently general[3]. To refine their analysis into empirically

[3]Dutta (2008) predicts that pay sensitivity is increasing in 'known' portion of managerial ability, which can be modeled as marginal productivity to uninformed (to shareholders) portion of managerial ability. Such

testable predictions, I make two further assumptions. First, we assume performance measures that can be possibly used for sorting are stock return and accounting return. Since I do not have a guiding theory that specifies which measure has better properties for sorting in certain circumstances, I simply examine both measures. Second, to focus on 'productivity' dimension of managerial ability, I assume managerial ability is sufficiently general on average rather than incorporate variables that measure how general CEO ability is.[4] A concept of explicit measure of generality of human capital for each firm or CEO and a cut-off criteria of the measure is elusive because prior literatures assumes time-varying pattern of generality (Murphy and Zabojnik 2003, Frydman 2007) and industry difference in generality (Dutta 2008).

To summarize, Lazear (2004) and Dutta (2008) claim that contingent terms in compensation can work as a sorting mechanism of managerial ability when a manager has private information about his own ability. Compared to agency theory, this argument shows what Dutta (2008) call "reverse causality." The new idea indicates that the reason shareholders make compensation sensitive to firm profitability is not always because they want to induce manager to work hard for better performance. Rather, the incentive pay schemes can be employed to address the shareholders' interest of attracting and retaining better managers

known portion of managerial ability can also be interpreted as perceived importance of managerial expertise.
[4]The assumption makes directional predictions possible, but I also examine settings where generality is likely to differ in additional tests.

who are more likely to lead firm to perform better. In the latter perspective, I predict positive correlation between sensitivity of compensation to performance measures and managerial ability.

To articulate the positive relation between the managerial ability and the sensitivity of compensation to performance, I consider properties of compensation structure and institutional details. Total executive compensation commonly consists of salary, annual bonus, stock options, and long term incentive plans that include restricted stock plans (Murphy, 1999). While cash compensation is based on performance of current period and hard to reverse once paid out (Leon et al. 2006), equity compensation requires managers to wait multiple periods to exercise and realize gains. Since shareholders are uncertain about the ability of CEO, they would require compensation contracts that allow both to keep CEOs long enough within a firm and to renegotiate terms[5] to reflect their evaluations about value of CEO human capital. In addition, there are claims such that stock option can work as a specific mechanism to initiate sorting discussed in Lazear (2004). Arya and Mittendorf (2005) claim that payoff structure of an option lead a manager to report his confidence about future firm profitability. According to their analysis, when shareholders provide a menu of mix of cash salary and stock options, managers with higher ability will choose

[5]An example is stock option repricing. Several researches investigating stock option compensation, especially option repricing practices (e.g., Carter and Lynch. 2001), claim that stock option can work as a mechanism to retain current managers, because its vesting period requirements and restriction on transactions give manager incentives to remain with a firm, reducing turnover cost (e.g., Core et al. 2003).

more generous (i.e., lower exercise price) option contract while giving up some portion of cash salary. Although it is still controversial whether executive stock options play such acclaimed roles, a bottom line is that total flow compensation package rather than cash compensation is more relevant definition of compensation to test sorting hypothesis. Thus, I hypothesize;

H1 : Sensitivity of total compensation to stock return is positively associated with managerial ability.

The underlying logic behind my first hypothesis is that shareholders intend to reduce information rents stemming from unknown managerial ability. Therefore, it is natural to question how the relation varies in environments with different degree of information asymmetry about managerial ability. Dutta (2008) shows that the pay-performance sensitivity is an increasing function of information risk (i.e. the degree of information asymmetry).[6] Then, what could be proxies for the information risk? One of intuitively appealing idea is that as CEO experience accumulates, his 'true' ability is revealed to managerial labor market since shareholders observe realized firm performance over time. Then, younger and less experienced CEOs have more incentives to try to affect perceptions about their ability (Harris and Holmstrom, 1982; Gibbons and Murphy, 1992; Holmstrom, 1999). Therefore, when CEOs are younger,

[6]Dutta (2008) indicates that this applies when managerial ability is sufficiently general. As mentioned earlier, this research assumes such circumstance.

information asymmetry issues will be more severe relative to moral hazard issues. We hypothesize that this will call for more use of sorting for younger CEOs.

H2 : When CEO is younger, the sensitivity of total compensation to stock return is more positively associated with the managerial ability.

One of the reasons that shareholders hire managers despite potential conflicts of interest and risk sharing issues is that shareholders expect them to have better skills and information for investments that would increase firm value (Murphy, 1999). Managers with higher ability can be interpreted as those who are able to identify and pursue more profitable investment projects. When the growth is a crucial factor for the firm's success, managers' capability of cultivating promising investments is very important and hence there is a greater need for precise understanding about the manager ability.

Many researches argue that higher growth opportunities pose a greater information asymmetry about firm prospects between managers and shareholders (e.g., Smith and Watts, 1992; Bizjak et al. 1993; Bushman et al. 1996). The basic intuition behind these reasoning is that growth opportunities usually come from introduction of new products and strategies, which are relative unknown to outsiders and take long time to materialize. In sorting perspective, sorting ability via the menu of incentive power levels is intended to make managers get responsible for firm performance and not attempt to over represent their capability to mislead labor managerial market. However, if the firm is considered

to have ample growth opportunities, the gap between truthful reporting and over-representation of managerial ability can be less emphasized; instead, ample growth opportunities of a firm can motivate shareholders to sort managers based on the stock return to make managers responsible for their claims. This argument leads to my third hypothesis.

H3 : Sensitivity of total compensation to stock return is more positively associated with managerial ability for those firms with larger growth opportunities.

In executive compensation literature, firm size, especially market capitalization is often considered as a proxy for managerial ability. The reason is that marginal effect of CEO human capital on firm value is to be rolled over thereby increasing in firm size and hence CEOs with higher ability is likely to be hired to a firm of larger scale (Rosen, 1982; Himmerberg and Hubbard, 2000; Gabaix and Landier, 2008). Another aspect related to the firm size is that larger firms are more exposed to public attention. Larger firms are also more exposed to media coverage about their CEOs and their compensation (Core et al., 2008) and receive more attention from financial analysts. Thus, I expect that the information asymmetry concern around the CEO ability is not as severe in larger firms as in smaller, less visible firms.

To reflect possible difference in contracting environments by firm size, I incorporate institutional difference that is closely related to firm size and rich

information environment. That is, inclusion in S&P 500 index[7]. Cadman et al. (2010) document difference in contracting environments between S&P 500 firms and other firms within ExecuComp database. According to their findings, S&P 500 firms are much larger and covered by more analysts, and its shares are more actively traded. I expect that if S&P 500 firms are exposed to more public attention and scrutiny, executives leading the firms are also exposed to such attention, thus, shareholders of those firms are more informed about CEOs. In contrast, I expect CEOs of firms not included in S&P 500 are relatively not well known, so shareholders have to rely more on passive variable pay mechanism to sort CEOs. Overall, while I hypothesize CEO age or firm growth opportunities to be source of uncertainty about managerial ability, I hypothesize inclusion in S&P 500 index to imply more resources to resolve the uncertainty. Thus, I expect S&P 500 firms will show less use of sorting schemes via pay-for-performance sensitivity since they have better resources to resolve information asymmetry.

H4 : Sensitivity of total compensation to stock return is associated less with managerial ability among firms that are included in S&P 500 index.

[7]To be included in S&P 500 index, unadjusted market capitalization of a firm should be more than $4 billion. A firm is also required to meet conditions such as level of liquidity, level of leverage, 4 consecutive quarters of positive earnings, certain time from initial IPO, and listings on major stock exchanges.

3. Data and Methodology

3.1. Sample Selection

Our sample period is between 1993 and 2009. Compensation data are obtained from Standard & Poor's ExecuComp database. Financial Statements data are from Standard & Poors' Compustat database, and the monthly stock return data are obtained from the Center for Research in Security Price (CRSP). I focus on compensation of CEOs. Observations are excluded if the CEO leaves the firm after less than a year, or if multiple CEOs work for the same firm for a year. Any observation with missing data on change in compensation, stock return, change in ROA, managerial ability, firm sales, or Book-to-Market Ratio is also excluded. I also delete an observation if the absolute value of change in the log of cash or total flow compensation exceeds two because such large value might be due to data errors (Leon et al., 2006). I winsorize every independent variable at extreme 1% to mitigate the effect of outliers.

3.2. Measurement of Managerial Ability

I adopt the measure of managerial ability of Demerjian et al. (2012). The measure is derived through two-stage process. The first stage is Data Envelopment Analysis (DEA) to derive firm efficiency. The analysis views a firm as a revenue maximizing unit with given seven inputs that are financial statement items; the items are Cost of Goods Sold, SG&A, PPE, Operating Lease, R&D,

Goodwill, and Other Intangibles. Then, relative efficiency within an industry-year cluster is derived by how close a firm is to the efficient frontier (i.e., how efficiently firms use their inputs compared to the most efficient firms). This relative efficiency is normalized to be bounded from 0 to 1[8]. In the second stage, Demerjian et al. (2012) take out persistent firm characteristics[9] from the efficiency measure by running tobit regression by industry, and consider residuals from the regression as a manager-specific component of firm efficiency.

Their measure has three notable characteristics. First, the measure does not directly include evaluations by information intermediaries such as analysts and media press[10]. Thus, the measure does not contain their interests possibly reflected in evaluation. Second, the measure considers certain firm characteristics as states that managers take as given, rather than as proxies for managerial heterogeneity. As mentioned in Demerjian et al. (2012), the procedure to derive the measure is similar to managerial fixed effects approach in its construction, but

[8]Firms are 'on' the efficient frontier are assigned with value of 1.

[9]Demerjian et al.(2012) propose six firm-specific characteristics that affect firm efficiency. They are size of total asset, market share of the firm in its product market, free cash flow, firm age, degree of within firm industry concentration, and foreign operation. Demerjian et al. (2012) predict positive effect of the first four variables on firm efficiency since the first four characteristics capture power of the firm that helps and eases off managerial decision making, but negative effects on the last two variables since they capture firm complexity.

[10]I do not intend to claim that these information intermediaries produce biased input for evaluations of managerial ability. Rather, I try to use a measure that is from a single source, which is financial statement since I do not know how different sources are mixed together.

gives ordinal ranking to the construct and can be derived from more general sample[11]. Third, the measure is attributable to the whole managerial team, rather than CEO himself. Thus, if I use this measure as a proxy for CEO ability, I implicitly assume quality of CEO is representative of quality of managerial team[12].

Prior studies use managerial ability measure of Demerjian et al. (2012) to examine whether financial reporting patterns vary with managerial ability. For example, Demerjian et al. (2011) show that managerial ability is positively associated with various measures of earnings quality, and Baik et al. (2012) document that CEOs with higher ability provide earning forecast more frequently, and that their forecasts are more accurate. My application of the measure of Demerjian et al. (2012) is more challenging because I assume not only how

[11]Several researches examine the effect of unobservable managerial heterogeneity on general firm policies including executive compensation. Bertrand and Schoar (2003) use the sample of executives who switch firms to examine how fixed effects penetrate in firm financing and investment policies and performance. Further, they find that fixed effects from difference aspects of firms are correlated with governance and compensation variables (e.g., fixed effects from ROA are positively correlated with residual portion of compensation). Graham et al. (2012) take an opposite direction. They examine how manager fixed effects penetrate in level of compensation and how these fixed effects are correlated with firm policies. They find that fixed effects lessen the effect of firm size on level of compensation, and are correlated with more investment activities. Coles and Li(2011) find that fixed effects from compensation delta(i.e., sensitivity of managerial wealth to stock price) is correlated with indicators of ability such as executive tenure, CEO dummy, and Serving-on-Board dummy, in support of hypothesis that managers with higher ability are associated with higher sensitivity of compensation to stock return.

[12]Several researches explore whether CEO and executive human capital are complementary. Fee and Hadlock (2004) find that dismissal of non-CEO executives are highly associated with turnover of CEO, particularly when replacement CEO is an outsider. Hayes et al.(2005) find that non-CEO executive departure is associated with CEO departure, especially when both are long –tenured, and that non-CEO is more likely to leave the firm when incoming CEO has shorter tenure with the firm. Hayes et al. (2005) interpret their findings as an evidence for complementarities across managers.

managers with higher ability affect decision making of a firm, but also how shareholders perceive managers' ability. If I test our hypotheses empirically by interacting ability and performance measure, I am implicitly assuming that the measure of managerial ability represents not the type that managers disguise, but the type that shareholders want to attract and retain. I claim this assumption is plausible for following two reasons. First, Demerjian et al. (2012) show that their measure is positively correlated with firm profitability and that negative stock market reaction follows turnover of managers with higher ability. Furthermore, if managers intend to misrepresent their ability, they would engage in more noticeable activities such as overinvestment and value-destroying acquisitions, so that their representations could be recognized and thereby affect valuation of their human capital in the managerial market.

3.3. Research Design and Variable Definitions

I estimate the following regression that relates the change in compensation to difference between realized and expected performance, assuming expected stock return is constant and last period accounting return is an expected return for current period (e.g., Lambert and Larcker, 1987; Sloan., 1993).

$$\Delta \ln(COMP_{it}) = \alpha + \beta_1 \mathrm{Re}t_{it} + \beta_2 \Delta ROA_{it} + \beta_3 Ability\_R_{it} + \beta_4 (\mathrm{Re}t_{it} * Ability\_R_{it}) + \beta_5 (\Delta ROA_{it} * Ability\_R_{it}) + \beta_6 \ln(Sales_{it}) + \sum \delta_j + \sum \varphi_t + \varepsilon_{it} \quad (1)$$

As a dependent variable, I use total flow compensation, which is the sum of salary, bonus, other annual compensation, long-term incentive payouts, restricted stock grants, Black and Scholes value of stock option grants, and all other compensation. Then, yearly change in the log of level compensation is derived. For performance measures, I use annualized stock return and ROA (Return on Assets). *Ret* is continuously compounded monthly dividend-inclusive return for current fiscal year period, and $\triangle ROA$ is one-year change of income before extraordinary items scaled by beginning book value of total assets.

To derive measure of managerial ability, *Ability_R*, first I derive raw managerial ability measure following Demerjian et al. (2012)[13]. To ease interpretation and enhance its visibility, I quartile rank measure of managerial ability by industry[14] and year within ExecuComp sample not excluded by prior censoring criteria[15], then the quartile rank of ability is interacted with performance measures. I also include managerial ability itself in the model because difference in managerial ability could be directly reflected in compensation contracts through individual performance evaluation. I interpret

[13]Demerjian et al. (2012) exclude financial services (banking, insurance, real estate, trading), utilities, and miscellaneous industry in their derivation of managerial ability, because financial service firms have different asset structure (e.g., higher leverage) and utilities have regulated output price. In addition, they grouped observations only by industry to derive firm efficiency, but I grouped observations by industry and year.

[14] I use industry classification of Fama and French(1997) since measure of managerial ability is based on the classification.

[15]As mentioned above, I delete any observation whose value of change in log of compensation exceeds two, but I include these observations when ranking raw value of ability, because the measure itself has nothing to do with possible data errors in ExecuComp database.

coefficients on interaction terms (β_4, β_5) as changes in sensitivity to performance measures to economize information risk, and coefficients on performance measures (β_1, β_2) as degree of incentive provision. To control general firm characteristics, I use log of sales as a proxy for firm size. In addition, industry and time dummies are also included. Standard errors are clustered by firm to adjust possible downward bias for standard errors by autocorrelation of time-series observations of a firm.

In my tests, β_4 and β_5 are parameters of interest. If results are consistent with first hypothesis, I expect $\beta_4 > 0$ for total flow compensation. My empirical strategy to test how use of sorting varies with information risk is to split the full sample based on measure for information risk for every industry and year. To test second hypothesis, I stratify the full sample into three groups by CEO age for every industry and year. Then I devise a dummy *Aged* which takes a value of 1 if a firm-year observation is in the highest group and 0 otherwise[16], and I split the full sample by value of *Aged*[17]. Because I expect that CEO ability is not fully known at his early stage of career and shareholders need to increase sensitivity of compensation to performance measure to economize information risk given degree of ability, I expect β_4 to be larger for subsamples where CEO

[16] I use this classification instead of industry-year median because other firm characteristics such as firm size, book-to-market ratio, and stock return are better controlled under this classification. See Panel A of table 4.

[17] 790 observations are excluded due to missing in CEO age.

is younger (i.e., *Aged*=0 subsample). To test third hypothesis first I use Book-to-Market Ratio at the end of last fiscal year as an inverse proxy for growth opportunities and information asymmetry. I devise a dummy *Growth* that takes a value of 1 if Book-to-Market Ratio is below industry-year median and 0 otherwise, and divide the full sample by value of the dummy. I expect more use of sorting with more growth options, so I expect β_4 to be larger in subsample of lower Book-to-Market ratio (i.e., Growth=1). To test last hypothesis, I examine our model (1) for S&P 500 index firms and other firms separately. Because I hypothesize that firms not listed in S&P 500 index relatively lacks enough resources to gather information about managerial ability, I expect β_4 to be larger for firms not listed in S&P 500 index.

4. Empirical Results

4.1. Descriptive Statistics

Table 1 reports descriptive statistics of full sample and that of subsamples divided by rank of managerial ability[18]. Panel A shows descriptive statistics of full sample. Firm size variables such as total asset, sales, and market capitalization are skewed to the right, and the mean is much higher than the median. Annualized stock return is 13.5% on average, and slightly right skewed.

[18]Note that annualized stock return, change in ROA, and market-to-book ratio are winsorized at 1% of both tails to reduce the effect of outliers. Also note that change in natural logarithm of total compensation and change in natural logarithm of cash compensation are truncated if their value is above 2 or below -2.

Return on Assets (ROA) is 4.2% on average and left skewed, but change in ROA shows a symmetric distribution, and is almost zero on average. More than 3/4 of firms' market value is higher than their assets in place. Both total and cash compensation are skewed to right, and mean is much higher than median, showing similar distributions with firm size variables. Both change in log of total compensation and log of cash compensation show that CEO compensation increase on average. Raw value of managerial ability shows a symmetric distribution, and average age of CEO is around 56.

Panel B in Table 1 shows comparisons between firms with CEOs across quartile rank of managerial ability. I quartile rank raw ability measure by industry and year. First three rows of Panel B show that firm size increase in ability rank for first two quartiles, but then decrease in last two quartiles[19]. As a result, rank of managerial ability show negative correlation with firm size variables and this negative correlation is a major difference between raw and ranked managerial ability. Next three rows show that firms with a CEO of higher ability perform better; annualized return, ROA, and change in ROA are monotonically increasing in rank of managerial ability. Another finding to note is that firms with managers of higher ability have lower Book-to-Market Ratio, a measure used as an inverse proxy for growth opportunities. An interpretation of this correlation is such that

[19]This hump-shaped pattern also appears when I use different number of rank and when I use a more general dataset which is only from Compustat.

managerial ability is an intangible asset that is off-the-book component of firm value, so managerial ability is correlated with firm value in excess of assets in place. In terms of compensation, both total and cash compensation increase in lower quartiles then decrease in higher quartiles. This pattern may be driven by firm size, but variation across quartiles is much lower. CEOs with higher managerial ability experience more increase in both total and cash compensation on average and have longer tenures. However, they are neither younger nor older.

Table 2 shows correlation coefficients. *Ability* is the raw value of managerial ability derived following Demerjian et al. (2012), and *Ability_R* is quartile rank of *Ability*. *Ability_R* is more negatively correlated with firm size than *Ability*. Except that, they both show similar patterns of correlation with other firm and CEO characteristic variables. They are negatively correlated with firm age and book-to-market ratio, and positively correlated with measure of firm performance such as annualized stock return, ROA, and change in ROA. Ability measures are also positively correlated with change in total compensation and tenure. Other correlation coefficients are consistent with prior literatures. Both total and cash compensation are strongly positively correlated with proxies for firm size, and performance measures (stock return, change in ROA) are more highly correlated with change in cash compensation than they are with change in total compensation.

4.2. Regression Results[20]

Results for my initial test are presented in Table 3. Both stock and accounting return are sensitive to either form of compensation, but only the interaction term that includes stock return is marginally significant (two-sided p-value=0.0556). These results indicate that total flow compensation of CEO is more sensitive to stock return when he is of higher ability. This result is consistent with my hypothesis that shareholders sort managers by varying sensitivity of compensation to performance measure. The effect is also economically significant. If the CEO belongs to the highest quartile of managerial ability, then his compensation is 31% more sensitive to annualized stock return (0.017*3+0.164=0.218) than CEOs in the lowest quartile (0.164). In addition, the results also show that managerial ability is significantly associated with total compensation (two-sided p-value=0.04). This result suggests that managers with higher ability directly receive more compensation, possibly based on individual performance evaluation.

I next stratify the full sample by age of CEO to test my second hypothesis. I expect variable pay to be used more for sorting when CEO is younger thus his ability is less revealed to managerial labor market. Panel A of Table 4 shows comparison of descriptive statistics of two subsamples. Proxies for firm size such

[20]In regression results, since I only examine compensation in form of change in log, I simply denote change in log of compensation as "compensation" for brevity.

as total asset, sales, and market capitalization significantly differ only in median and stock return and change in return on assets do not differ significantly across these two subsamples. Older CEOs receive more cash compensation, and their mix of pay tilt toward cash compensation. They also experience less increase in their total pay. Results in Panel B of Table 4 show results consistent with my second hypothesis. The interaction between return and managerial ability is significant only when CEO is younger (two sided p-value is 0.0586 when CEO is younger but 0.5652 when older) and coefficient is also much larger (0.021 when younger and 0.009 when older). This contrast shows that younger CEOs tend to have compensation contracts that are more sensitive to stock return given his ability ex-post due to higher information risk about his human capital.

Next, I examine how sorting mechanism is affected by firm growth opportunities. Comparison of descriptive statistics by growth opportunities are presented in Panel A of Table 5. Unlike Panel A of table 4, Panel A of table 5 show significant differences between two groups. Firms with higher growth opportunities (i.e., lower book-to-market ratio) show lower stock return and higher ROA, and have CEOs of higher ability. Those firms are much larger in term of market capitalization and pay more non-cash compensation to their CEOs. In addition, firms with more growth opportunities display higher level of capital expenditure and R&D, more cash holdings, and low leverage. In summary, subsamples divided by growth opportunities show much more difference in

multiple aspects compared to subsamples divided by CEO age. This difference may contribute to puzzling results that will be presented next.

In Panel B of Table 5, the first two columns show that total compensation of firms with lower book-to-market ratios display more sensitivity to stock returns. However, interaction between stock return and CEO ability is both economically and statistically significant for the low growth options subsample[21], but trivial in both magnitude and significance for the high growth options subsample. Recall my hypothesis such that when information asymmetry about investment projects is higher, firms try to increase pay-for-performance sensitivity given managerial ability to economize the information rent. However, the results are contrary to my hypothesis. According to my hypothesis, I should have a higher coefficient for interaction terms in a subsample of firms with higher growth options.

I interpret this result based on how book-to-market ratio is derived: from the perspective of the value of intangible assets instead of its usual way to proxy the growth. Managerial ability cannot be incorporated into the balance sheet under the current accounting rules. Thus, the higher the managerial ability, the lower the book-to-market should follow. Nevertheless, this association is not automatic but need a condition—the market participants must understand the

[21] P-value for the interaction term is 2.86 %. The effect is also economically significant. If the CEO belongs to the highest quartile of managerial ability, then his compensation is 43 % more sensitive to annualized stock return (0.025*3+0.172=0.247) than managers in the lowest quartile (0.172).

managerial ability. In other words, when the managerial ability is not observed by the stakeholders in the capital market, the market value does not reflect the managerial ability and book-to-market ratio would be overestimated. If the managerial ability is an important component of intangible assets and book-to-market ratio is affected by the capital market's perception on managerial ability, then lower (higher) book-to-market ratio can be interpreted as smaller (greater) information asymmetry on the managerial ability, which makes this result consistent to my prediction.

Based on my interpretation, lower book-to-market ratio implies both higher uncertainty about product development and lower uncertainty about managerial ability. Then, it is ambiguous to consider book-to-market ratio a directional measure of information asymmetry about managerial ability. Thus, I adopt more specific measure of information asymmetry, which is R&D investment. R&D investment is an important value driver, but outsiders relatively lack references to infer its value. Aboody and Lev (2000) suggest R&D intensity as a more firm-specific measure of information asymmetry for following three reasons. First, compared to tangible inputs, R&D projects are unique to a firm. Second, R&D projects are not traded in an organized market, so there is no market equilibrium price which investors are able to use to infer its value. Third, under current accounting rule, R&D investment is not capitalized but immediately expensed, so financial statements have limited informational use.

Furthermore, Banker et al. (2011) suggest that demand for managerial ability is high for R&D intensive firms and adverse selection issues become more important for those firms. While Banker et al. (2011) predicts that decrease in sensitivity for financial measures and increase in sensitivity for signals of ability such as education, I also expect that use of sorting will increase for those R&D intensive firms. Following Aboody and Lev (2000), I consider firms with nonzero R&D expenditure as firms with greater information asymmetry. Results in Panel C show a pattern consistent with my hypothesis. The interaction term between stock return and ability is only significant for the sample of firms with nonzero R&D expenditure (two-sided p-value=0.0738).

Next, I examine how use of sorting differs by firm size and associated institutional difference; I consider inclusion in S&P 500 index as an indicator for such difference. Results shown in Table 6 show a stark contrast. Managerial ability is significantly directly associated with total compensation when firms are listed in S&P 500 (two-sided p-value=0.0217), while its interaction with return is significantly associated with total compensation only when firms are not listed in S&P 500 (two-sided p-value=0.0186). A possible interpretation for this contrast is as follows. Direct association of CEO ability with total compensation can be viewed as active reflection of CEO human capital to compensation contracts. Shareholders of those firms are more informed about their CEOs, so they more directly tie value of CEO human capital to their pay. In contrast, CEOs of firms

not included in S&P 500 do not receive enough attention, so shareholders have to rely on passive variable pay mechanism to sort CEOs.

Since a pattern consistent with use of sorting is not observed for S&P 500, it is natural to examine if effect of information risk on use of sorting is also attenuated in different contracting environment represented by inclusion in S&P 500 index. I address this question by dividing sample by measure of information risk within S&P 500 firms and other firms, respectively.

In the first two columns of Panel A of Table 7, it is shown that among firms not listed in S&P 500, when CEOs are younger, use of sorting is more active (i.e., The coefficient for *Ret*Ability_R* is both positive and significant; two-sided p-values are 0.0318). This pattern is consistent with that of full sample shown in Table 4. However, among S&P 500 firms, use of sorting is not observed irrelative of CEO age, but direct reflection of managerial ability is observed only when CEO is younger (two-sided p-value is 0.0502). This contrast suggests that only firms not under much public attention increase use of sorting for relatively unknown younger CEOs, and that managerial ability is directly reflected to compensation and such reflection decrease with CEO age when firms receive considerable attention.

In Panel B, the interaction term between stock return and ability is only significant when firms are not listed in S&P 500 and are holding lower growth options (two-sided p-value=0.0229). However, again use of sorting is not

observed irrelative of growth options for S&P 500 firms. CEO ability is slightly more strongly reflected to compensation when S&P 500 firms hold lower growth options, but the coefficient is statistically insignificant. In Panel C, results also show clear contrast. Among firms not listed in S&P 500, use of sorting is only observed for firms with nonzero R&D expenditures; the interaction term is both economically and statistically significant. However, among firms listed in S&P 500, managerial ability is directly reflected to compensation only for firms with R&D expenses. Overall, results in Table 7 imply that firms in different contracting environments, represented by S&P500 index inclusion, use different mechanisms to reflect value of managerial ability in CEO compensation contracts when information risk about such ability is higher.

5. Additional Tests

5.1. Investment opportunity sets and managerial ability

One recurring discussion from my studies is an association between managerial ability and investment opportunity sets. Two interpretations can be possible for this association; CEOs with better managerial skills actually creates more investment sets or CEOs expected to have such skills are assigned to firms with ample investment sets. It is beyond the focus of my study to distinguish between these two interpretations, but it is important to examine effect of such association on pay-performance sensitivity. Prior literatures (e.g., Baber et al.,

1996) suggest that market-based performance measure (e.g., stock return) is a forward-looking measure that incorporates anticipation of future cash flow from current investment, so with more investment opportunities, firms will rely on more market-based performance measures. Under this hypothesis, positive association between pay sensitivity to stock return and managerial ability appear not because owners try to mitigate information asymmetry problem and attract more able managers, but because more able managers are assigned to firms with more investment opportunities. To address this alternative explanation, I add Book-to-Market ratio, leverage, and firm age to regression (1) as additional explanatory variables that are associated with investment opportunity sets (Leone et al., 2006). I also add interactions of these variables with stock return (*Ret*) and test our main hypotheses again. Table 8 tabulates comparison of results of the modified model with those of the prior model[22]. Model (1) is the original specification, and Model (2) is the modified specification. Overall, even though both statistical significance and magnitude for the interaction term *Ret*Ability_R* declines with modified specification, results are qualitatively similar except for R&D investment subsample (Panel D)[23]. On the other hand, direct reflection of managerial ability to compensation loses its significance with modified specification. However, such direct association still holds for S&P500 subsample

[22]I only tabulate results for coefficients of variables of interest such as *Ret*, *Ability_R*, and *Ret*Ability_R*. Results for other coefficients are available upon request.

[23] When I run Model (2) for tests conducted in Table 7, I find that *Ret*Ability_R* stays significant (two-sided p-value=0.0568, coefficient=0.0255) for non-S&P 500 with nonzero R&D investment subsample.

(Panel E).

5.2. Difference in generality of human capital across industries: New Economy Firms

In previous sections, we have discussed firm and CEO specific factors that can influence the use of differential pay-for-performance levels to sort managers in terms of their unknown ability. However, industry specific effect could also affect this sorting mechanism through difference specificity of human capital required. In particular, I look at compensation contracts of firms in high tech industries. As documented in earlier studies (Anderson et al, 2000; Ittner et al., 2003; Murphy et al., 2003), firms in high tech(or 'new economy') industries are characterized by broad use of stock options in their compensation contracts even to lower level of employees. This finding is puzzling in incentive provision perspective, since these employees hold too little portion of firm value and their respective contribution to firm value is not clearly verifiable. Dutta (2008) argues that the type of managerial ability required for these firms is a reason for this tendency. According to Dutta (2008), managers' human capital is more important factor in high tech firms' operation, and their ability is more general because, in high-tech industry, it is easier for managers to set up their own venture with their expertise. Then, if difference in managerial ability is mainly attributable to massive use of stock options, most of sensitivity of compensation to stock return

will come from sorting purpose; in term of my empirical design, the interaction effect between stock return and managerial ability will be more strengthened.

Table 9 shows results from examining model (1) for subsample of new economy firms[24] [25]. Among new economy firms, significance level and magnitude of coefficient for stock return is much lower (two-sided p-vale=0.0139, 0.085), implying less importance of stock return as a performance measure for incentive provision. However, the interaction term between stock return and CEO ability shows coefficient of 0.040 with statistical significance (two-sided p-value=0.0453), displaying huge swing by managerial ability. If a CEO is in the highest quartile of managerial ability, his compensation is 141% more sensitive to stock return (0.04*3+0.085=0.205) compared to CEO with the lowest ability (0.085). Compared to 33% difference for the full sample, this difference is surprising and it implies that stock-based compensation plans of high tech firms are largely initiated for sorting purpose.

[24]Murphy (2003) classify firms with SIC codes 3570, 3571, 3572, 3576, 3577, 3661, 3674, 4812, 4813, 5045, 5961, 7370, 7371, 7372, 7373 as new economy firms. In Fama-French industry classification, most of these firms belong to Communication, Business Services, Computers, and Electronics Equipment industry.

[25]Prior literatures that discuss generality of human capital (e.g., Murphy and Zabojnik., 2007; Frydman., 2007) predict increase in external hire as general managerial skills become important. To find a support for difference in generality, I compare proportion of external hires between new economy firms and other firms in our full sample and find a significant difference. Specifically, I code a difference between the date when a CEO joins the firm and the date when a CEO become CEO in Exeucomp and make an indicator *Extdum* that has a value 1 if the difference is less than one year and 0 otherwise(due to missing values, we only have 9,762 observations). I found that while the average of *Extdum* for new economy firms is 0.49, the average for other firms is only 0.30. The difference is significant at 1% level.

5.3. Increase in importance of general managerial skill

Murphy and Zabojnik (2004, 2007) claim that with improvements in information technology and in general managerial disciplines from academics, general managerial skills become more important to manage firms, and that this change leads to the trend of increase in both top executive pay and external hires. If generally applicable managerial expertise is more valued in managerial labor market, then managers will gradually improve general aspect of their ability, or managers with more general skills will be more likely to be retained. Finally, shift toward general managerial ability will cause increase in sensitivity of compensation to performance measure for given degree of managerial ability. To examine this change, I divide our sample period, from 1993 to 2009, into two periods, before and after 2001, and run our model (1) for these two subsamples. Table 9 shows a clear contrast between two periods. In recent periods, after 2001, managerial ability is significantly related to total compensation directly and through interaction with stock return. However, in periods before 2001, total compensation is not responsive to managerial ability in either way. This contrast shows that it is a recent trend that managerial ability is reflected in CEO compensation contracts, possibly due to increase in general aspect of CEO expertise.

6. Conclusion

Retaining and attracting valuable human capital is an important concern that affects design of CEO compensation contracts. Shareholders want to hire right CEOs in their firms, but when only CEOs are informed about their own ability, CEOs could extract information rents from shareholders. As a mechanism to economize information rents, shareholders can increase variable portion of pay to attract better human capital. I examine this use of variable pay for sorting in CEO compensation using a sample from ExecuComp database and a measure of managerial ability from Demerjian et al. (2012). I find that sensitivity of total flow compensation to annualized stock return is increasing in managerial ability and that this positive relationship is found mostly when CEO is younger or when firms have relatively smaller Book-to-Market ratio. Furthermore, I also find that firms not included in S&P 500 index more actively utilize variable pay for sorting, and that sensitivity of compensation to stock return of firms in high technology industries largely stems from our hypothesized sorting perspective. In addition, I also find that a pattern consistent with use of sorting is a recent trend.

My findings have three main limitations. First, I assume managerial ability is sufficiently general, but a violation of this assumption can bias some of results. For example, as CEO age, his human capital can be more tied to a firm due to his specific learning from the firm. Then, lack of sorting in aged CEO subsample might be partly attributable to decrease in generality, not entirely to

decrease in information asymmetry. Second, throughout the study, I implicitly assume shareholders (or their representatives) mostly set CEO compensation, but it is also possible that CEOs with higher ability are more influential over the decisions made by board of directors, thus deter some adjustments aimed at economizing information rents. In relation to this, I only focus on compensation contracts as a control mechanism to extract information about managerial ability, but other corporate governance structures differ by firm and such structures can be associated with managerial ability and ex-post pay sensitivity. Third, I consider only productivity of human capital as a source of heterogeneity of CEOs, but there are other sources of heterogeneity such as risk aversion and wealth, and it can have a substantial effect on sorting mechanism and pay sensitivity.

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Table 1
Descriptive Statistics

Panel A : Descriptive Statistics of full sample

Variable	Mean	Median	Std.Dev	1st	25th	75th	99th	Obs
Total Asset	4587.34	1061.49	15049.32	53.18	404.87	3226.54	52342.00	18,262
Sales	4100.72	1125.18	10287.65	22.07	423.45	3285.30	46307.00	18,262
Market Cap	5666.28	1173.67	17989.40	44.64	456.70	3654.63	85429.89	18,262
Ret	0.135	0.071	0.525	-0.800	-0.186	0.348	2.404	18,262
ROA	0.042	0.057	0.364	-0.432	0.016	0.101	0.327	18,262
⊿ROA	-0.006	0.000	0.094	-0.400	-0.030	0.022	0.353	18,262
Book-to-Market Ratio	0.61	0.60	0.26	0.11	0.42	0.80	1.33	18,262
Firm Age	18.5	19.0	8.3	2.9	10.9	25.0	32.0	18,262
Total Comp	4325.36	2409.07	6860.21	233.90	1178.06	5009.84	27920.48	18,262
Cash Comp	1225.22	885.44	1524.71	150.00	565.24	1415.19	5937.50	18,262
⊿ln(Total Comp)	0.065	0.058	0.639	-1.689	-0.250	0.390	1.757	18,262
⊿ln(Cash Comp)	0.026	0.039	0.412	-1.210	-0.109	0.198	1.136	18,262
Ability	0.007	0.011	0.110	-0.313	-0.039	0.057	0.307	18,262
CEO Age	55.5	56.0	7.5	39.0	51.0	60.0	77.0	17,472
CEO Tenure	7.8	5.5	7.5	0.5	2.6	10.4	36.3	17,267

Panel B : Descriptive Statistics of the sample divided by managerial ability

Variable	Mean by *Ability_R*				Median by *Ability_R*			
	1	2	3	4	1	2	3	4
Total Asset	4487.38	8084.80	4411.12	1228.80	961.31	2073.50	1478.93	529.36
Sales	4193.26	6851.92	3960.62	1296.67	885.48	2068.91	1614.62	605.49
Market Cap	4734.68	10189.14	5545.94	1974.42	815.07	2005.82	1740.12	744.99
Ret	0.085	0.137	0.154	0.162	0.021	0.078	0.098	0.080
ROA	-0.028	0.047	0.068	0.077	0.027	0.056	0.068	0.077
⊿ROA	-0.014	-0.004	-0.002	-0.006	-0.001	0.000	0.000	-0.001
Book-to-Market Ratio	0.70	0.62	0.59	0.55	0.70	0.61	0.58	0.53
Firm Age	18.1	19.4	19.0	17.2	19.0	20.0	20.0	17.0
Total Comp	3917.54	5508.91	4706.42	3071.10	2124.54	3181.13	2880.16	1732.62
Cash Comp	1094.23	1446.26	1335.56	1001.13	800.00	1003.92	1000.00	731.66
⊿ln(Total Comp)	0.037	0.058	0.081	0.080	0.036	0.056	0.068	0.070
⊿ln(Cash Comp)	0.018	0.020	0.029	0.036	0.031	0.039	0.046	0.040
Ability	-0.115	-0.013	0.043	0.109	-0.092	-0.008	0.031	0.081
CEO Age	55.3	55.6	55.7	55.4	55.0	56.0	56.0	55.0
CEO Tenure	7.4	7.2	7.9	8.9	5.1	5.1	5.5	6.0

Note : The full sample is 18,262 firm-year observations during 1993-2009. Data are taken from ExecuComp, Compustat, CRSP database. *Sales* is one year lag sale ("SALE"). *Market Cap* is one year lag of a product of the number of outstanding shares ("CSHO") and the stock price at the end of the year ("PRCC_F"). *Ret* is continuously compounded monthly dividend-inclusive return for current fiscal year period. *ROA* is current income before extraordinary items ("IB") scaled by beginning book value of total assets ("TA"), and *⊿ROA* is one year change of *ROA* for a firm. *Book-to-Market Ratio* is beginning book value of total assets divided by sum of (beginning book value of assets-beginning book value of common equity) and one year lag market cap ("AT"/("AT"-"CEQ"+*Market Cap)*). *Firm Age* is the number of years a firm has been listed in Compustat. *Total Comp* is a sum of salary, bonus, other annual compensation, long-term incentive payouts, restricted stock grants, Black and Scholes value of stock option grants, and all other compensation ("TDC1" in ExecuComp). *Cash Comp* is a sum of salary and bouns ("TOTAL_CURR" in ExecuComp). *⊿ln(Total Comp*) is a year change of log of *Total Comp*, and *⊿ln(Cash Comp)* is a year change of log of *Cash Comp*. *Ability* is derived by following Demerjian et al. (2012). We used Banxia Software's Frontier Analyst 4 to conduct DEA analysis which yields firm efficiency. *Age* is age of current CEO. *Tenure* is number of months between a date when current CEO became CEO and a fiscal-year end date, scaled by 12. In Panel A, *Ret*, *⊿ROA*, *Book-to-Market Ratio* are winsorized values; they are winsorized at extreme 1% and 99%.Variable *⊿ln(Total Comp*) and *⊿ln(Cash Comp*) are truncated*;* they were truncated if its value exceeds two. In Panel B, the full sample is divided by value of *Ability_R*. We quartile rank *Ability* by industry and year to derive *Ability_R*.

Table 2
Correlation Coefficients

	Ability	*Ability_R*	*Total Asset*	*Sales*	*Market Cap*	*Ret*	*ROA*	*△ROA*	*Book-to-Market Ratio*	*Firm Age*	*Total Comp*	*Cash Comp*	*△ln(Total Comp)*	*△ln(Cash Comp)*	*CEO Age*	*Tenure*
Ability	1	0.8109*	-0.0720*	-0.0280*	0.0515*	0.0592*	0.2865*	0.0098	-0.2124*	-0.0495*	-0.0048	0.0198	0.0289*	0.0228*	0.0015	0.0540*
Ability_R	0.7214*	1	-0.1780*	-0.1176*	-0.0547*	0.0590*	0.2830*	0.019	-0.1917*	-0.0480*	-0.0812*	-0.0486*	0.0327*	0.0192	-0.0098	0.0686*
Total Asset	-0.0271*	-0.1010*	1	0.9159*	0.8393*	0.0074	-0.018	0.0046	0.1160*	0.3814*	0.6579*	0.6442*	-0.008	-0.0285*	0.1298*	-0.0990*
Sales	-0.0307*	-0.1268*	0.8624*	1	0.7594*	0.0226*	0.0627*	0.0102	0.1109*	0.4074*	0.6020*	0.6425*	-0.0025	-0.0410*	0.1438*	-0.1003*
Market Cap	0.0105	-0.0821*	0.5572*	0.5624*	1	-0.0490*	0.2760*	-0.0214*	-0.3675*	0.2495*	0.6733*	0.5807*	0.0024	-0.0392*	0.0795*	-0.0546*
Ret	0.0483*	0.0510*	-0.0177	-0.0161	-0.0440*	1	0.2503*	0.3432*	0.1097*	0.0017	0.0802*	0.1756*	0.1762*	0.2228*	0.0134	0.0159
ROA	0.1128*	0.1006*	0.0048	0.0157	0.0349*	0.0808*	1	0.3058*	-0.5683*	-0.0137	0.1564*	0.1935*	0.1147*	0.1006*	0.0298*	0.0754*
△ROA	0.0314*	0.0301*	0.0044	0.0076	-0.0062	0.2944*	0.1843*	1	0.0093	0.0229*	0.0619*	0.1495*	0.1613*	0.2681*	0.0057	-0.0354*
Book-to-Market Ratio	-0.1807*	-0.1943*	0.0442*	0.0287*	-0.1934*	0.1316*	-0.0907*	0.0092	1	0.1773*	-0.1363*	-0.0089	-0.0253*	0.0205*	0.0709*	-0.0539*
Firm Age	-0.0200*	-0.0433*	0.1773*	0.2311*	0.1462*	-0.0286*	0.0381*	0.0300*	0.1705*	1	0.2367*	0.2772*	-0.0154	-0.0674*	0.1765*	-0.0549*
Total Comp	0.0206*	-0.0555*	0.3030*	0.3125*	0.3917*	0.0278*	0.0374*	0.0101	-0.1294*	0.1176*	1	0.6923*	0.2732*	0.0556*	0.0281*	-0.0746*
Cash Comp	0.0192*	-0.0298*	0.2574*	0.2706*	0.2466*	0.0636*	0.0457*	0.0601*	-0.0074	0.1671*	0.4829*	1	0.1082*	0.2771*	0.1705*	-0.0023
△ln(Total Comp)	0.0246*	0.0259*	-0.0081	-0.0077	0.0012	0.1451*	0.0446*	0.0890*	-0.0251*	-0.0109	0.2177*	0.0662*	1	0.2820*	-0.0202*	-0.0186
△ln(Cash Comp)	0.0154	0.0167	-0.0340*	-0.0388*	-0.0446*	0.1990*	0.015	0.1854*	0.0451*	-0.0655*	0.0084	0.1860*	0.2486*	1	-0.0074	-0.0071
CEO Age	0.0249*	0.006	0.0307*	0.0368*	0.0147	-0.0128	0.0405*	0.0093	0.0697*	0.1841*	0.0141	0.1133*	-0.0225*	-0.0074	1	0.3411*
Tenure	0.0583*	0.0757*	-0.0676*	-0.0850*	-0.0558*	0.0123	0.0309*	-0.0156	-0.0374*	-0.0145	-0.0283*	0.0420*	-0.0093	-0.0015	0.4292*	1

Note : This table reports Pearson correlation coefficients below the diagonal and Spearman correlation coefficients above the diagonal. See Note in Table 1 for variable definitions. * denotes significance at 1% level.

Table 3
Managerial Ability and Sensitivity of Compensation to Performance Measures

	Dependent Variable
Variable	*△ln(Total Comp)*
Intercept	-0.205***
	(<.0001)
Ret	0.164***
	(<.0001)
△ROA	0.364***
	(0.0004)
Ability_R	0.007**
	(0.04)
*Ret*Ability_R*	0.017*
	(0.0556)
*△ROA*Ability_R*	-0.048
	(0.39)
ln(sales)	0.005**
	(0.0109)
Sample Size	18,262
Adjusted R^2	3.63

Note : This table reports results from OLS regression run on full sample described in Table 1. Dependent variable is *△ln(Total Comp*). Independent variables are *Ret*, *△ROA*, *Rability*, *ln(sales)*, an interaction between *Rability* and *Ret*, and an interaction between *△ROA* and *Rability*. *ln(sales)* is log of *Sales*, and other variables are as defined in note of Table 1. P-values are presented in parentheses below the coefficients and are based on standard errors clustered by firm. Industry and year fixed effects are also included in all regressions. *, **, *** indicate that coefficients are different from zero at 10, 5, and 1 percent significant levels, respectively.

Table 4
Managerial Ability and Sensitivity of Compensation to Performance Measures : Effect of CEO Age

Panel A : Descriptive Statistics

	Aged=0		*Aged=1*		Diff in Mean (1)-(0)	Diff in Median (1)-(0)
Variable	Mean	Median	Mean	Median		
CEO Age	51.7	52.0	63.3	62.0	11.6***	10.0***
Ability	0.006	0.011	0.010	0.013	0.004**	0.002**
Total Asset	4491.41	1028.00	4796.47	1126.40	305.06	98.40***
Sales	4026.80	1086.32	4261.86	1197.96	235.06	111.64***
Market Cap	5563.90	1150.56	5889.45	1220.17	325.55	69.61**
Ret	0.134	0.066	0.139	0.078	0.005	0.012
ROA	0.039	0.056	0.048	0.060	0.009	0.004***
⊿ROA	-0.009	0.000	-0.005	0.000	0.004	0.000
Book-to-Market Ratio	0.61	0.60	0.62	0.61	0.01**	0.01***
Firm Age	17.9	18.0	19.7	19.9	1.8***	1.9***
Total Comp	4295.35	2414.14	4390.78	2399.31	95.43	-14.83
Cash Comp	1159.41	850.00	1368.67	956.25	209.26***	106.25***
Noncash	0.54	0.60	0.49	0.53	-0.05***	-0.07***
⊿ln(Total Comp)	0.072	0.067	0.049	0.044	-0.023**	-0.023***
⊿ln(Cash Comp)	0.024	0.040	0.030	0.037	0.006	-0.003

Panel B : Regression Results

Variable	Dependent Variable ⊿*ln(Total Comp)*	
	Aged=0	*Aged=1*
Intercept	-0.182***	-0.261***
	(<.0001)	(<.0001)
Ret	0.162***	0.170***
	(<.0001)	(<.0001)
⊿ROA	0.358***	0.374*
	(0.0022)	(0.0502)
Ability_R	0.006	0.008
	(0.1452)	(0.1871)
*Ret*Ability_R*	0.021*	0.009
	(0.0586)	(0.5652)
*⊿ROA*Ability_R*	-0.048	-0.040
	(0.4563)	(0.7127)
ln(sales)	0.003	0.010***
	(0.2667)	(0.0075)
Sample Size	12,519	5,743
Adjusted R^2	3.72	4.27

Note : .In Panel A, the full sample is divided into two samples by value of *Aged*. *Aged* is derived as follows; the full sample is divided into three groups by CEO age for every industry-year group and *Aged* is coded 1 if an observation belongs to the highest CEO age group. Otherwise, *Aged* is 0. *Noncash* is (*Total Comp – Cash Comp*)/*Total Comp*. **,*** denotes significance at the 5% and 1% level for two-tailed t-tests (Wilcoxon rank-sum tests) to determine whether means (medians) are different between two subsamples. In Panel B, results of OLS regression separately run for each of two subsamples described in Panel A are reported. See note of Table 1 for variable definitions. P-values are presented in parentheses below the coefficients and are based on standard errors clustered by firm. Industry and year fixed effects are also included in all regressions. *, **, *** indicate that coefficients are different from zero at 10, 5, and 1 percent significant levels, respectively.

Table 5
Managerial Ability and Sensitivity of Compensation to Performance Measures : Effect of Firm Growth Opportunities

Panel A : Descriptive Statistics

	Growth=0		*Growth=1*		Diff in Mean	Diff in Median
Variable	Mean	Median	Mean	Median	(1)-(0)	(1)-(0)
Book-to-Market Ratio	0.79	0.78	0.43	0.43	-0.36***	-0.35***
Ability	-0.006	0.000	0.022	0.023	0.028***	0.023***
Total Asset	5100.12	1149.60	4055.34	971.97	-1044.78***	-177.63***
Sales	4156.81	1184.52	4042.53	1060.41	-114.28	-124.11***
Market Cap	3421.32	772.86	7995.39	1791.26	4574.07***	1018.40***
Ret	0.166	0.086	0.104	0.056	-0.062***	-0.030***
ROA	0.011	0.033	0.074	0.091	0.063***	0.058***
△ROA	-0.007	0.000	-0.009	0.000	-0.002	0.000
Firm Age	19.3	19.9	17.6	18.0	-1.7***	-1.9***
Total Comp	3781.88	2145.56	4889.21	2720.77	1107.33***	575.21***
Cash Comp	1212.18	874.60	1238.74	900.00	26.56	25.40**
Noncash	0.50	0.54	0.55	0.62	0.05***	0.08***
△ln(Total Comp)	0.061	0.058	0.068	0.060	0.007	0.002
△ln(Cash Comp)	0.039	0.037	0.012	0.042	-0.027***	0.005***
Leverage	0.24	0.24	0.18	0.15	-0.06***	-0.09***
Cash Holding	1.93	0.21	2.23	0.41	0.30***	0.20***
Tangible	0.44	0.22	0.38	0.20	-0.06***	-0.02***
Capex	0.25	0.17	0.35	0.25	0.10***	0.08***
R&D	1.34	0.09	0.84	0.15	-0.50	0.06***

Panel B : Regression Results : Book-to-Market subsample

Variable	Dependent Variable ⊿*ln(Total Comp)*	
	Growth=0	*Growth=1*
Intercept	-0.286***	-0.117**
	(<.0001)	(0.0072)
Ret	0.172***	0.185***
	(<.0001)	(<.0001)
⊿ROA	0.315**	0.396**
	(0.0153)	(0.0079)
Ability_R	0.005	0.005
	(0.2966)	(0.3798)
*Ret*Ability_R*	0.025**	0.001
	(0.0286)	(0.8965)
*⊿ROA*Ability_R*	-0.026	-0.058
	(0.7334)	(0.4337)
ln(sales)	0.014***	-0.004
	(.0001)	(0.2689)
Sample Size	9,299	8,963
Adjusted R^2	4.79	3.41

Panel C : Regression Results : R&D investment subsample

	Dependent Variable	
Variable	*⊿ln(Total Comp)*	
	No R&D	*R&D*
Intercept	-0.136**	-0.307***
	(0.0011)	(<.0001)
Ret	0.174***	0.151***
	(<.0001)	(<.0001)
⊿ROA	0.606***	0.259**
	(0.0014)	(0.0309)
Ability_R	0.000	0.014***
	(0.9264)	(0.0079)
*Ret*Ability_R*	0.009	0.022*
	(0.481)	(0.0738)
*⊿ROA*Ability_R*	-0.106	-0.027
	(0.2777)	(0.6903)
ln(sales)	0.000	0.007***
	(0.979)	(0.0048)
Sample Size	8,843	9,419
Adjusted R^2	3.54	4.22

Note : .In Panel A, the full sample is divided into two samples by value of *Growth*, which takes a value of 0 if Book-to-Market Ratio of a firm is above industry and year median of the ratio and 1 otherwise. **,*** denotes significance at the 5% and 1% level for two-tailed t-tests (Wilcoxon rank-sum tests) to determine whether means(medians) are different between two subsamples. *Leverage* is a sum of long term debt and debt in current liabilities ("DLTT"+"DLC") divided by total assets ("TA"); All numbers are in one year lag. *Cash Holdings* is cash and short term investments ("CHE") divided by net property, plant, and equipment ("PPENT"); All numbers are in one year lag. *Capex* is current capital expenditures ("CAPX") scaled by one year lag net property, plant, and equipment ("PPENT"). *R&D* is current research and development expense ("XRD") scaled by one year lag net PPE ("PPENT"). See note of Table 1 for definitions of other variables. In Panel B, results of OLS regression separately run for each of two subsamples described in Panel A are reported. In Panel C, the full sample is divided into two subsamples. If R&D expense ("XRD") is missing or zero, an observation is classified as "No R&D". Otherwise, an observation is classified as "R&D". Results of OLS regression separately run for each of two subsamples are reported. P-values are presented in parentheses below the coefficients and are based on standard errors clustered by firm. Industry and year fixed effects are also included in all regressions. *, **, *** indicate that coefficients are different from zero at 10, 5, and 1 percent significant levels, respectively.

Table 6
Managerial Ability and Sensitivity of Compensation to Performance Measures : Difference between S&P 500 Index Firms and Other Firms

	Dependent Variable	
Variable	*⊿ln(Total Comp)*	
	Other	*S&P 500*
Intercept	-0.185***	-0.278***
	(<.0001)	(<.0001)
Ret	0.159***	0.211***
	(<.0001)	(<.0001)
⊿ROA	0.372***	0.340
	(0.0006)	(0.2906)
Ability_R	0.005	0.023**
	(0.22)	(0.0217)
*Ret*Ability_R*	0.023**	-0.018
	(0.0186)	(0.5061)
*⊿ROA*Ability_R*	-0.054	-0.028
	(0.3549)	(0.8692)
ln(sales)	0.005	0.005
	(0.1072)	(0.3311)
Sample Size	13,904	4,358
Adjusted R^2	3.74	4.29

Note : . Table 6 reports results from OLS regression separately run for each of two subsamples. The full sample is divided into two subsamples based on S&P 500 index indicator from ExecuComp database; if "SPCODE" is coded "SP", then an observation is assigned to *S&P 500*, and to *Other* otherwise. See note of Table 1 for variable definitions. . P-values are presented in parentheses below the coefficients and are based on standard errors clustered by firm. Industry and year fixed effects are also included in all regressions. *, **, *** indicate that coefficients are different from zero at 10, 5, and 1 percent significant levels, respectively.

Table 7
Managerial Ability and Sensitivity of Compensation to Performance Measures :
Effect of CEO Age and Firm Growth opportunities for S&P 500 Index Firms and Other Firms

Panel A : CEO age subsample

	Dependent Variable=*⊿ln(Total Comp)*			
Variable	*Others*		*S&P500*	
	Aged=0	*Aged=1*	*Aged=0*	*Aged=1*
Intercept	-0.174***	-0.217***	-0.256***	-0.323**
	(<.0001)	(0.0006)	(0.0034)	(0.0231)
Ret	0.154***	0.174***	0.227***	0.198***
	(<.0001)	(<.0001)	(0.0009)	(0.0229)
⊿ROA	0.369***	0.394*	0.412	0.145
	(0.0026)	(0.0534)	(0.2877)	(0.8108)
Ability_R	0.004	0.005	0.025*	0.021
	(0.4107)	(0.4108)	(0.0502)	(0.2098)
*Ret*Ability_R*	0.025**	0.017	-0.011	-0.052
	(0.0318)	(0.3199)	(0.7385)	(0.2189)
*⊿ROA*Ability_R*	-0.049	-0.075	-0.084	0.139
	(0.4714)	(0.527)	(0.6622)	(0.6682)
ln(sales)	0.002	0.010**	0.007	0.003
	(0.5176)	(0.0485)	(0.3075)	(0.7838)
Sample Size	9,606	4,298	2,913	1,445
Adjusted R^2	3.58	4.89	4.34	3.54

Panel B : Book-to-Market subsample

	Dependent Variable=⊿*ln(Total Comp)*			
Variable	*Others*		*S&P500*	
	Growth=0	*Growth=1*	*Growth=0*	*Growth=1*
Intercept	-0.276***	-0.076	-0.368**	-0.190**
	(<.0001)	(0.178)	(0.0134)	(0.0399)
Ret	0.169***	0.177***	0.207***	0.223***
	(<.0001)	(.0001)	(0.0048)	(0.0026)
⊿ROA	0.322**	0.415**	0.292	0.369
	(0.0146)	(0.0109)	(0.636)	(0.3577)
Ability_R	0.002	0.002	0.026	0.020
	(0.6562)	(0.7038)	(0.1504)	(0.1816)
*Ret*Ability_R*	0.026**	0.011	0.004	-0.031
	(0.0229)	(0.5076)	(0.9245)	(0.374)
*⊿ROA*Ability_R*	-0.047	-0.057	0.163	-0.099
	(0.559)	(0.482)	(0.6328)	(0.612)
ln(sales)	0.015***	-0.006	0.012	-0.002
	(0.0006)	(0.2753)	(0.3552)	(0.7458)
Sample Size	7,735	6,169	1,564	2,794
Adjusted R^2	4.66	3.63	6.80	2.82

Panel C : R&D Investment subsample

	Dependent Variable=⊿*ln(Total Comp)*			
Variable	*Others*		*S&P500*	
	No R&D	*R&D*	*No R&D*	*R&D*
Intercept	-0.138***	-0.153***	-0.020	-0.020***
	(0.0049)	(0.0002)	(0.8364)	(<.0001)
Ret	0.180***	0.139***	0.168**	0.228***
	(<.0001)	(<.0001)	(0.0252)	(0.0016)
⊿ROA	0.631***	0.263**	0.170	0.432
	(0.0014)	(0.0388)	(0.8074)	(0.2622)
Ability_R	-0.003	0.012**	0.015	0.031**
	(0.6079)	(0.0329)	(0.2839)	(0.0372)
*Ret*Ability_R*	0.011	0.030**	-0.009	-0.019
	(0.4426)	(0.0204)	(0.7831)	(0.6131)
*⊿ROA*Ability_R*	-0.140	-0.021	0.270	-0.156
	(0.1719)	(0.7687)	(0.4939)	(0.4341)
ln(sales)	0.001	0.005	-0.015**	0.016**
	(0.7467)	(0.1692)	(0.0383)	(0.0289)
Sample Size	7,012	6,892	1,831	2,527
Adjusted R^2	3.70	4.20	3.33	4.96

Note : In Panel A, the full sample is first divided *S&P 500* and *Other*. Then, within each subsample, observations are divided into two groups based on the value of Aged, the dummy defined in Table 4. Results from OLS regression separately run for each of four groups are reported. Likewise, in Panel B, the full sample is first divided based on S&P 500 index indicator, and each sample is divided into two groups based on the value of Growth, the dummy defined in Table 5. Results from OLS regression separately run for each of four groups are reported. See Table 1 for variable definitions. P-values are presented in parentheses below the coefficients and are based on standard errors clustered by firm. Industry and year fixed effects are also included in the regression. *, **, *** indicate that coefficients are different from zero at 10, 5, and 1 percent significant levels, respectively.

Table 8
Managerial Ability and Sensitivity of Compensation to Performance Measures :
Additional controls : Book-to-market, Leverage, and Firm Age

Model (1)

$$\Delta \ln(COMP_{it}) = \beta_0 + \beta_1 \mathrm{Ret}_{it} + \beta_2 \Delta ROA_{it} + \beta_3 Ability\_R_{it} + \beta_4 (\mathrm{Ret}_{it} * Ability\_R_{it}) + \beta_5 (\Delta ROA_{it} * Ability\_R_{it}) + \beta_6 \ln(Sales_{it}) + \sum \delta_j + \sum \varphi_t + \varepsilon_{it}$$

Model (2)

$$\Delta \ln(COMP_{it}) = \eta_0 + \eta_1 \mathrm{Ret}_{it} + \eta_2 \Delta ROA_{it} + \eta_3 Ability\_R_{it} + \eta_4 (\mathrm{Ret}_{it} * Ability\_R_{it}) + \eta_5 (\Delta ROA_{it} * Ability\_R_{it}) + \eta_7 (\mathrm{Ret}_{it} * BtoM_{it}) + \eta_8 (\mathrm{Ret}_{it} * Leverage_{it}) + \eta_9 (\mathrm{Ret}_{it} * Firm\_Age_{it}) + \eta_{10} \ln(Sales_{it}) + \eta_{10} BtoM_{it} + \eta_{11} Leverage_{it} + \eta_{12} Firm\_Age_{it} + \sum \delta_j + \sum \varphi_t + \varepsilon_{it}$$

Panel A : Full sample

	Dependent Variable=*△ln(Total Comp)*	
Variable	*Model (1)*	*Model (2)*
Ret	0.164***	0.166***
	(<.0001)	(<.0001)
Ability_R	0.007**	0.004
	(0.04)	(0.33)
*Ret*Ability_R*	0.017*	0.016*
	(0.0556)	(0.0821)
Sample Size	18,262	18,200
Adjusted R2	3.63	3.71

Panel B: CEO age subsample

	Dependent Variable=*△ln(Total Comp)*			
Variable	*Model (1)*		*Model (2)*	
	Aged=0	*Aged=1*	*Aged=0*	*Aged=1*
Ret	0.162***	0.171***	0.175***	0.141***
	(<.0001)	(<.0001)	(<.0001)	(0.0151)
Ability_R	0.007	0.008	0.002	0.006
	(0.1452)	(0.1871)	(0.7021)	(0.3254)
*Ret*Ability_R*	0.021*	0.009	0.019*	0.009
	(0.0586)	0.5652	(0.0969)	(0.5741)
Sample Size	12,519	5,743	12,473	5,727
Adjusted R2	3.72	4.27	3.87	4.32

Panel C : Book-to-Market subsample

	Dependent Variable=*⊿ln(Total Comp)*			
Variable	*Model (1)*		*Model (2)*	
	Growth=0	*Growth=1*	*Growth=0*	*Growth=1*
Ret	0.172***	0.185***	0.208***	0.192***
	(<.0001)	(<.0001)	(0.0002)	(0.0001)
Ability_R	0.005	0.005	0.004	0.004
	(0.2966)	(0.3798)	(0.4755)	(0.5575)
*Ret*Ability_R*	0.025**	0.001	0.026**	0.000
	(0.0286)	(0.8965)	(0.0225)	(0.9779)
Sample Size	9,299	8,963	9,273	8,927
Adjusted R2	4.79	3.41	4.95	3.44

Panel D : R&D investment subsample

	Dependent Variable=*⊿ln(Total Comp)*			
Variable	*Model (1)*		*Model (2)*	
	No R&D	*R&D*	*No R&D*	*R&D*
Ret	0.174***	0.151***	0.149**	0.173***
	(<.0001)	(<.0001)	(0.0112)	(<.0001)
Ability_R	0.000	0.014***	-0.003	0.010*
	(0.9264)	(0.0079)	(0.5518)	(0.0928)
*Ret*Ability_R*	0.009	0.022*	0.012	0.017
	(0.481)	(0.0738)	(0.403)	(0.1685)
Sample Size	8,843	9,419	8,821	9,379
Adjusted R2	3.54	4.22	3.56	4.45

Panel E: S&P500 index subsample

	Dependent Variable=*⊿ln(Total Comp)*			
Variable	*Model (1)*		*Model (2)*	
	Other	*S&P 500*	*Other*	*S&P 500*
Ret	0.159***	0.211***	0.170***	0.203***
	(<.0001)	(<.0001)	(<.0001)	(0.029)
Ability_R	0.005	0.023**	0.000	0.023**
	(0.22)	(0.0217)	(0.99)	(0.0323)
*Ret*Ability_R*	0.023**	-0.018	0.021**	-0.015
	(0.0186)	(0.5061)	(0.0341)	(0.5982)
Sample Size	13,904	4,358	13,865	4,335
Adjusted R2	3.74	4.29	3.88	4.31

Note : Table 8 report results from OLS regression run with **Model (1)** and **Model(2)**. In **Model (2)**, *BtoM* is *Book-to-Market ratio* defined in Table1, *Firm_Age* is *Firm Age* defined in Table1, and *Leverage* is as defined in Table 5. Other variables are as defined in previous tables. Through Panel A~ Panel E, results under label *Model (1)* are duplicated from Table 3-6, and results under label *Model (2)* are obtained by running regression **Model (2)** above for each subsample separately. P-values are presented in parentheses below the coefficients and are based on standard errors clustered by firm. Industry and year fixed effects are also included in the regression. *, **, *** indicate that coefficients are different from zero at 10, 5, and 1 percent significant levels, respectively.

Table 9
Managerial Ability and Sensitivity of Compensation to Performance Measures : For New Economy Firms

	Dependent Variable
Variable	*⊿ln(Total Comp)*
Intercept	-0.365***
	(<.0001)
Ret	0.085**
	(0.0139)
⊿ROA	0.290*
	(0.0906)
Ability_R	0.013
	(0.2246)
*Ret*Ability_R*	0.040**
	(0.0453)
*⊿ROA*Ability_R*	-0.082
	(0.4396)
ln(sales)	0.003
	(0.54)
Sample Size	2,882
Adjusted R^2	4.68

Note : This table reports results from OLS regression run on the sample of high tech firms, defined as firms assigned with one of following SIC codes: 3570, 3571, 3572, 3576, 3577, 3661, 3674, 4812, 4813, 5045, 5961, 7370, 7371, 7372, and 7373. See note of Table 1 for variable definitions. P-values are presented in parentheses below the coefficients and are based on standard errors clustered by firm. Industry and year fixed effects are also included in the regression. *, **, *** indicate that coefficients are different from zero at 10, 5, and 1 percent significant levels, respectively.

Table 10
Managerial Ability and Sensitivity of Compensation to Performance Measures : Comparison across Time - Before and After 2001

	Dependent Variable	
Variable	*⊿ln(Total Comp)*	
	Prior	Recent
Intercept	-0.006	-0.142***
	(0.8914)	(0.0002)
Ret	0.207***	0.123***
	(<.0001)	(<.0001)
⊿ROA	0.389**	0.375***
	(0.0166)	(0.0036)
Ability_R	-0.002	0.014***
	(0.7022)	(0.0021)
*Ret*Ability_R*	0.010	0.024**
	(0.5130)	(0.0384)
*⊿ROA*Ability_R*	-0.144	0.001
	(0.1119)	(0.9921)
ln(sales)	0.013***	0.000
	(0.0005)	(0.9253)
Sample Size	7,202	11,060
Adjusted R^2	4.17	3.11

Note : The full sample is divided into two subsamples based on whether an observation is of a calendar year after 2001. If the year is after 2001, an observation belongs to *Recent* subsample. Otherwise, it belongs to *Prior* subsample. Table 9 reports results from OLS regression separately run for each of these two subsamples. See Table 1 for variable definitions. P-values are presented in parentheses below the coefficients and are based on standard errors clustered by firm. Industry and year fixed effects are also included in all regressions. *, **, *** indicate that coefficients are different from zero at 10, 5, and 1 percent significant levels, respectively.