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경영학석사학위논문

**The Effect of 2006 SEC Disclosure  
Regulation on CEO's pay-performance  
sensitivity**

2006 증권거래소 공시규율 개정안이  
최고 경영자의 성과-보상 민감도에  
미치는 효과

2019 년 2 월

서울대학교 대학원

경영학과 회계학 전공

임 현 정



# **The Effect of 2006 SEC Disclosure Regulation on CEO's pay-performance sensitivity**

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## **Abstract**

This study examines the effect of 2006 SEC Compensation Disclosure Regulation on CEO's pay-performance sensitivity change under the presence of both moral hazard and adverse selection. I find that after the implementation of the new regulation, pay-performance sensitivity for the negative return has increased, whereas pay-performance sensitivity for the positive return has decreased. I further investigate such asymmetric changes in pay-performance sensitivity in the post-regulation period from two perspectives: excess compensation and managerial ability. I find that the main results prevail at firms that had excessively paid their CEOs and that had less competent CEOs. Overall results suggest that the new regulation has not only induced firms to reduce information rent in CEO incentive contracts, but also changed CEO incentive contracts more efficiently on the subject of managerial ability.

**Keywords:** 2006 SEC Disclosure Regulation, pay-performance sensitivity,  
Incentive contracts, CEO ability

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# I. Introduction

Agency theory has been one of the most important paradigms in accounting research (Lambert, 2001). Theoretical papers have examined the incentive contract design as a way to alleviate agency problem between principal and agent (Holmstrom, 1979; Holmstrom, 1999)

Holmstrom (1979) has proved that only a second-best solution of risk-sharing can be achieved under the presence of moral hazard or information asymmetry. Since the principal cannot observe the action an agent would take at the beginning of the contract, it is optimal *ex ante* for the principal to design incentive contracts including performance measures for agents to induce proper level of effort. Theoretical explanation of such result explains the explicit use of imperfect information in incentive contracts. Holmstrom (1979) also demonstrated the value of information that any informative signal available about the agent's action would generally improve the design of contracts (e.g. re-negotiation), even if the information were imperfect.

By extending the dynamics of incentive contracts with more than a single period, Holmstrom (1999) considered manager's talent as a determinant in incentive contract design (when moral hazard disappears in the long-run). He demonstrated that managers' incentive problems are closely related to managerial ability, which can be revealed to the principal as time passes. Holmstrom (1999) also suggested that under the condition in which managers cannot verify the risk of investments,

even risk-neutral managers would result in zero-investments in equilibrium as lemons in Akerlof (1970). For the reason why such incentive problems are less severe in practice compared to theory, Holmstrom (1999) explains that payoffs are convex function of talent and induce managers to be less risk-averse, suggesting that risk-taking incentives are used as a signal of talent for individual managers.

As shown by prior literatures, incentive contracts aligned with both manager's effort and talent would have value that would mitigate information asymmetry between principal and agent. Further problem in incentive contract design is, however, that information asymmetry can also occur between shareholders and boards (Bebchuk and Fried, 2003; Bebchuk and Fried, 2004). Shareholders appoint boards or compensation committees to set incentive contracts in behalf of their interest, but in fact, there is a possibility of negotiation between boards and CEOs since boards could have an incentive to stay in the firm in subsequent periods. CEOs normally appoint this process, and therefore, prior literatures have pointed out those boards or compensation committees might not behave as a trustworthy agent for shareholders (Bebchuk and Fried, 2003; Armstrong et al, 2010). Prior literatures suggest that such agency problem could deteriorate the incentive contract design through CEO power aligned with board members' support. To alleviate the second stage of agency problem, Bebchuk and Fried (2003) argued that increased disclosure transparency would be helpful to mitigate such improper compensation receiving behavior of CEOs as well as opportunistic behavior of board members.

In this sense, the Securities and Exchange Commission (SEC) has implemented



compensation disclosure regulations to reply the call for new regulations. In light of the necessity for the new disclosure regulation, SEC has announced in January 2006, approved in July 2006, and revealed in August 2006 of the new mandated compensation disclosure regulation, effective on or after December 15, 2006. According to Grant (2008, CPA Journal), the new disclosure regulation change is not to increase the amount of information, but to provide information transparency to the market and to shareholders for their governance. The 2006 disclosure regulation requires all publicly traded firms to disclose the compensation of their executives (including CEOs, CFOs, and Board members) in detail.

Until recently, prior literatures have investigated the effect of the new disclosure regulation focusing on specific disclosure contents<sup>1</sup>. Such features of the newly disclosed information have been the subject of accounting research with respect to the new regulation change in compensation disclosure. Different from previous literatures, more and more literatures are investigating the new perspective of the 2006 SEC disclosure regulation: a shock that incurred information transparency increase through additionally disclosed information (Gipper, 2017; Bloomfield, 2018; Ferri et al, 2018; Wang et al, 2018). These papers focus on whether the new disclosure regulation has changed manager's incentive contract assuming that such disclosure has brought valuable information to update incentive contracts by the

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<sup>1</sup> Perquisite disclosure (Grinstein et al, 2011), peer selection related researches (Albuquerque et al, 2013; Bizjak et al, 2011; dman and Carter, 2013; Faulkender and Yang, 2010; Gong, Li and Shin, 2011), and compensation consultants (Murphy and Sandino, 2010).

principal (Holmstrom, 1979; Holmstrom, 1999).

If the new regulation has indeed brought additional value through the disclosed information as SEC has intended, CEOs' action or talents could be assessed more precisely, implying that principal has gained informative signal over the agent, and thereby able to modify incentive contracts for CEOs.

Gipper (2017) find that the level of total and cash compensation has increased after the implementation of the new regulation, and Bloomfield (2018) find that firms among Cournot competition use revenue-based performance more strategically in the post-regulation period. Both papers indicate modification in incentive contracts of CEOs has occurred in the post-regulation period. Wang et al (2018) investigated the pay-performance sensitivity for the acquiring CEO's post-poor performance of acquired firms under M&A setting. Since M&A is the setting that reveals severe agency problem (Harford and Li, 2007), Wang et al (2018) has shown that such problematic issues have been mitigated after the implementation of the new disclosure regulation. In contrast, Ferri et al (2018) dealt the new regulation as an external shock that only reduced investors' uncertainty of managers' reporting objectives, but not as the case that caused incentive contract modification. They empirically tested whether the new disclosure regulation had induced changes in managerial incentive contracts, and concluded that such regulation shock would not explain the increase in ERC through changes in risk taking incentives, which denotes pay-performance sensitivity, as managements have already coped with the new regulation change in advance starting from 2007.

Armstrong and Kepler (2018) have reviewed the discrepant findings in prior literatures, discussing Peng and Roell (2008, 2014). Peng and Roell (2008) demonstrated that pay sensitivity for the stock price is enhanced when investors' uncertainty for managers is heightened, but managers have incentives to manipulate the stock price for their own sakes. Armstrong and Kepler (2018) reasoned that if alternative hypotheses<sup>2</sup> by Peng and Roell (2008, 2014) are correct as managers' incentives are endogenously determined, managers' incentive contracts should be modified as the result of the information transparency increase followed by the new disclosure regulation. With respect to such discrepancy issues, Armstrong and Kepler (2018) has noted that it would be useful to investigate the plausible cause that brought seemingly different findings between two stems of assumptions (whether the new disclosure regulation has induced changes in compensation contracts or not) from prior researches. Therefore, I investigate whether the new disclosure regulation has induced changes in managers' incentive contracts, especially in the perspective of pay-performance sensitivity as the component of the incentive contract, which reflects risk-sharing incentives to find out whether CEOs' incentive contracts are modified in the post-regulation period.

I also consider that 2006 SEC disclosure regulation on executives' pay scheme is a useful instrument to reconcile the controversy between Holmstrom (2005) and

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<sup>2</sup> Ferri et al (2018) only assumed investors' uncertainty changes as the result of the new regulation by demonstrating that managers had prepared for the new regulation and might have adjusted their pay scheme beforehand.

Bebchuk and Fried (2004). Holmstrom (2005) maintains that Bebchuk and Fried's (2004) power theory cannot solely explain pay setting mechanism and that they overlooked a critical component of executive pay determination, 'shareholder influence'.<sup>3</sup> Holmstrom (2005) disagrees with Bebchuk and Fried's (2004) two major arguments on overpayment to executive officers: (i) lack of transparency and (ii) too much power of CEOs. Instead, Holmstrom (2005) explained the pay level increase with respect to labor market theory and benchmarking theory<sup>4</sup>. In addition, he argued that power hypothesis does not bring the real difference in the structure of executives' pay but rather career concern of managers is an explanation that is more plausible. Therefore, investigating the effect of 2006 SEC disclosure regulation on executive's pay scheme would reveal through what mechanism does executives' incentive contracts are determined.

As pay-performance sensitivity shows how tightly managers' pay levels are linked to their performances, investigating the effect of the new disclosure regulation on CEOs' pay-performance sensitivity change would well-demonstrate whether the new regulation has delivered additional information that is valuable to shareholders or outside investors in the perspective of governance.

I used both difference-in-difference analysis and subsample analysis to investigate

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<sup>3</sup> Holmstrom (2005) explained that CEO power is not a bad thing, but what caused the chaos in practice is the shareholder's influence over CEO's decision-making mechanism.

<sup>4</sup> Holmstrom (2005) reasons two tests to refute the power theory. One is the timing test as executive's pay level has been increasing before it became an issue on the table. The other is the comparative institutional test as there is no difference in executive pay patterns between privately own companies and publicly held companies.

the change in CEO pay-performance sensitivity based on the new disclosure regulation. Garvey and Milbourn (2006) has suggested that CEOs are less penalized for their bad luck than rewarded for their good luck. They argued such asymmetric benchmarking could be an evidence showing CEOs seeking rent extraction behavior since CEOs are rewarded with more option grants that compensate for the bad luck. Based on this prior literature, I assumed that increased information transparency between agent and principle through the new disclosure regulation would mitigate such asymmetric benchmarking between good and bad luck. The result of this paper supports the assumption.

To explain the overall change in CEOs' incentive contracts with respect to pay-performance sensitivity, I propose two hypotheses with regard to excess compensation and CEO ability. First, Robinson et al (2011) has empirically shown that non-compliance of firms in the first year of the new compensation regulation was related to their high excess paying behavior. Defects in pay-performance disclosure mostly explained the non-compliance in the first year of the regulation for the high excess compensation hypothesis<sup>5</sup>. Ferri et al (2018) also checked that ERC of firms that had high excess paying behavior show more increase in post-regulation period; increase in ERC was more pronounced in firms that did not received SEC

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<sup>5</sup> Although Robinson et al (2011) has additionally tested whether such defects in performance or corporate governance is related to subsequent decrease in excess compensation, they find that mean reversion in CEO compensation as from Core et al (2008) could be an alternative explanation. However, in my study, I have extended more than a single period both in pre- and post-regulation period, and therefore, there is a little possibility that the change in excess compensation after the new mandatory disclosure is stemmed from mean reversion. Instead, I discovered the overall change in the subsequent CEO compensation slope with respect to performance metrics.

comment letter for lack of compliance. Wang et al (2018) also reasoned high excess paying behavior was what induced greater pay-performance sensitivity increase in the post-poor performance sensitivity of acquiring firms. Therefore, for the overall firms, I also reason high excess compensation for CEOs as one explanation that induces asymmetric change in pay-performance sensitivity for good and bad performances in the post-regulation period. The results show that high excess paying compensation explains the increase in pay-performance sensitivity for bad performance, possibly implying CEOs' rent seeking behavior through additional option grants has alleviated (Garvey and Milbourn, 2006).

My second explanation for the asymmetric change in pay-performance sensitivity between good and bad performances is CEOs' ability. Prior literatures have theoretically demonstrated that CEOs' talent (or ability) could be meaningful determinant in the level of pay-performance sensitivity (Holmstrom, 1999; Banker et al., 2013; Banker et al., 2015). Holmstrom (1999) has theoretically proved that managers' talent and incentive problems are closely related. Banker et al. (2013) has shown that the past performance measures reveal the ability of CEOs and that the information from the past could be useful in deciding the level of fixed and contingent portion of compensation. Banker et al. (2015) demonstrated the optimal use of pay-performance sensitivity in light of the tension between pre-contracting screening process and post-contracting incentivizing objective. Ideas that CEOs ability is one important variable that could affect incentive contract design, following prior literatures, I also assumed that CEOs' ability could explain the asymmetric

change in pay-performance sensitivity between good and bad performances. I anticipate the new disclosure regulation would provide the board of directors with more precise information about the CEO ability and help them develop more efficient incentive contracts. Results from this study show that CEOs with less ability explains the asymmetric change in pay-performance sensitivity between the good and bad performances.

Contribution of this study is that it provides evidence that the new disclosure regulation has positively influenced toward CEOs' compensation practices. Empirical results imply that the new disclosure contents have enhanced investors' capability to assess the CEO ability and helped revise the incentive contracts in a way of avoiding excessive pay caused by previously opaque information about CEO ability. This research is consistent to Gipper et al.'s (2017) explanation on the pay level increase after the new regulation through CEO labor market theory. He mentioned that such new regulation could work both as a benefit to CEOs by broadening their outside opportunities through lowered hiring costs and as a cost to CEOs by reducing power between shareholders who could induce changes in their incentive contracts. My result supports Gipper et al (2017) that the level of total compensation in the post-regulation period has increased, accompanied by the change in pay-performance sensitivity. In addition, this paper contributes to the new perspective of research that considers the new disclosure regulation as a shock.

The rest of this paper is as follows: Section II briefly introduces 2006 SEC Compensation Disclosure regulation and prior literatures regarding the new

regulation and hypotheses are developed. Section III describes sample selection procedure and model specification. Section IV presents the main results of the test. Additional tests are shown in Section V and robustness check is covered in Section VI. Conclusion and further discussions are presented in Section VII.

## **II. Background and Hypothesis Development**

### **2.1. Background for 2006 SEC Compensation Disclosure Regulation**

In January 2006, SEC has announced that it will implement the new disclosure regulation regarding executives' compensation. Effective for firms whose fiscal year-end comes or after December 15, 2006, all publicly traded firms are required to disclose their executives' compensation information; executives including CEO, CFO and Directors, and compensation information should describe the grounds their executives' pays are based on. The intention of such new regulation by SEC is not to increase the amount of information, but to provide a clearer and detailed information to improve governance by shareholders and outside investors (Grant, CPA Journal 2008). Thus, such new regulation change reflects increased transparency in compensation information.

2006 SEC Compensation Disclosure changed many components from the previous settings in 1992, but the most salient and key change in the new regulation is CD&A (Compensation Disclosure and Analysis) section in annual proxy statement filings. CD&A section is a narrative disclosure that contains new information explaining



performance metrics to determine bonus to executives, timing and pricing of option grants, and additional corporate governance disclosure related to executive compensation and more.

Such improved information environment supported by the new regulation could be a useful setting to evaluate the effect of mandated disclosure regulation on executives' compensation scheme. Prior researches dealt the new compensation regulation change have focused on the effect of 2006 SEC compensation disclosure regulation on specific contents, such as perquisites (Grinstein et al , 2011), peer selection related researches (Albuquerque et al, 2013; Bizjak et al, 2011), and the use of compensation consultants( Murphy and Sandino, 2010). Recently, studies have investigated the overall effect of such regulation change on pay level (Gipper, 2017), strategic use of revenue-based performance metrics (Bloomfield, 2018), change in investors' uncertainty about the managers' reporting objectives (Ferri et al, 2018), and acquiring CEOs' pay-performance sensitivity for post-acquisition poor-performance under M&A setting (Wang et al, 2018).

However, as many papers are using the new regulation change as a useful setting for investigation, there arise some conflict between papers that assume whether the new disclosure regulation has changed manager's compensation contract design. Gipper (2017) and Bloomfield (2018) suggest that the new disclosure regulation induced changes in managers' pay scheme, while Ferri et al (2018) assume that the only change occurred is the uncertainty level of investors' on managers' reporting objectives. Therefore, following the discussion from Armstrong and Kepler (2018),

I investigated whether there would be changes in executives' compensation contract measured through overall firms' pay-performance sensitivity.

## **2.2. Hypothesis Development**

Along 2006 SEC Compensation Disclosure regulation, investors of each company are better informed of their executives' compensation structure as well as that of other companies or competing firms. I anticipate that such information being more transparent than before would allow shareholders to intervene the executive compensation committee's decision on pay schemes or make it harder for the compensation committee to include stealth and/or unreasonable compensation terms into the executive compensation contracts. In this research, I focus particularly on pay-performance reward schemes in contrast to prior studies examining total pay levels. In order to capture the change in pay-performance sensitivity that reflects the decreased level of information asymmetry, I applied the prior conjecture following Garvey and Milbourn (2006) that executive compensation contracts are inefficient *ex ante*: asymmetric benchmarking in CEO pay.

I first investigate whether the new regulation has affected pay-performance sensitivity changes symmetrically between good and bad performances. According to Garvey and Milbourn (2006), CEO pay contracts move asymmetrically for the bull and bear market. Authors argue that if the boards are to use external benchmarks for their agents' compensation contract, those benchmarks should be applied in equal direction – rise in bull market, fall in bear market. Garvey and Milbourn (2006) has

empirically presented the negative sensitivity for CEOs' pay on bad luck, which indicates external force that are not in control by managers. Harford and Li (2007) find that the asymmetric benchmarking story by Garvey and Milbourn is much stronger under the M&A setting, in which agency problem is more likely to rise<sup>6</sup>. Sample period from both Garvey and Milbourn (2006) and Harford and Li (2007) indicates pre-regulation environment, therefore, both literatures could explain such rent extraction behavior before the new disclosure regulation was implemented. Wang et al (2018) extended the research from Harford and Li (2007) with the M&A setting after 2006 SEC disclosure regulation and found that pay-performance sensitivity for the negative return in post-acquiring deals has increased. Although prior literatures return evidence that CEOs' opportunistic pay scheme in the pre-regulation period has been alleviated in the post-regulation period for M&A firms, evidence for the effects of the new disclosure regulation on overall firms are lacking. Through the result from Wang et al (2018), we might analogize the positive direction of the change in pay-performance sensitivity for bad performance measured as negative return. For good performances measured as positive return, pay-performance sensitivity could change in negative direction if the uncertainty of outside investors toward managers' reporting objectives are reduced (Peng and Roell, 2008) or if shareholders have a less intent to tightly manage executives' risk-

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<sup>6</sup> It might seem that asymmetry benchmarking for CEOs is driven by M&A setting, but the result from cross-sectional analysis in Harford and Li (2007) shows such asymmetric benchmarking for bad luck is not necessarily driven by M&A. It is more profound under M&A, but does not seem to drive the result.

preference toward their benefits of firm value maximization due to increased information transparency (Holmstrom, 1979). Decreased value of pay-performance sensitivity for good performance would indicate the increased governance through enhanced value of information from increased transparency. However, little evidence exists regarding the change between pay-performance sensitivity for good performance. Thus, as pay-performance sensitivity change for good performance is ambiguous with the dearth of information, I set the hypothesis in the null form:

***H1:** There is no difference in CEO pay-performance sensitivity change for good performance and bad performance after 2006 SEC Compensation Disclosure Regulation. (null)*

Next, I examine a couple of firm-level characteristics that might be associated with such asymmetric response on the new regulation: (i) whether firms have rewarded excessive pay to the executive due to the lack of benchmark (H2) and (ii) whether firms have overpaid their executives due to unknown ability of the executive officers (H3). After the new disclosure regulation became effective on December 15, 2006, SEC completed its first-year review of 350 companies that required improvements in their disclosure or compliance (Robinson et al, 2011; Grant, CPA Journal 2008). Robinson et al (2011) has investigated 350 firms that received critics from SEC in 2007 and find that managers' self-interest measured by high excess compensation drove the noncompliance of the new compensation disclosure rules. Robinson et al (2011) also suggested that deficit in disclosure of pay-performance content was

mostly driven by high excess compensation. Ferri et al (2018) tested the ERC change with firms paying high excess compensation and low excess compensation and reached to the conclusion that firms paying high excess compensation faces more increase in ERC, meaning high excess compensation paying firms are expected for greater improvement in compensation information through disclosure. Exploiting the M&A setting, Wang et al (2018) also assumed high excess paying firms to be relatively more affected group by the new disclosure regulation and found that increase in pay for post-poor performance after the acquisition was greater in more affected firms rather than less affected firms. As our first hypothesis assumed there would be asymmetric change in pay-performance sensitivity between good and bad performances, I exploit the excess paying behavior of firms to distinguish between firms that are more reluctant to disclose information and firms that are less reluctant to disclose information.

To align with the results from prior literatures, I presume the asymmetric change in pay-performance sensitivity between good and bad performances would be greater in firms that are more reluctant to disclose information, namely firms having high excess-paying behavior:

***H2:** Firms paying high excess compensation would have more asymmetry on their CEOs' pay-performance sensitivity change between good performance and bad performance than firms paying low excess compensation in post-regulation period.*

Another explanation along the high excess-paying firm behavior is managerial ability. Holmstrom (1999) suggested that in order to earn returns for good performances, there should be information about future performance given by the present performance, which delivers the information of manager's talent or ability. As Holmstrom (1999) suggests, managerial ability would work as a valuable information when changing or designing incentive contracts since it reflects the part that brings the outcome besides the level of effort managers input.

There are several prior literatures investigating the relation between CEO ability and compensation. Milbourn (2003) has shown that managerial ability and stock-based pay-performance sensitivity tends to have positive relation. Rajgopal et al (2006) has investigated the relation between CEO ability and the use of RPE (relative performance evaluation) and found the result that supports Oyer (2004) that less RPE is optimal for high ability managers. Arya and Mittendorf (2005) show stock options can be used to gauge managerial talent, meaning high contingent portion in compensation contracts could be used to sort more able managers from less able managers. Dutta (2008) also show that optimal pay-performance sensitivity is higher than the value under symmetric information for high ability managers. Banker et al (2015) demonstrated that uncertainty regarding managerial ability (whether he has high or low ability) could play an important role in incentive contract design. Since principal has to screen out high ability managers from low ability managers for their benefit, Banker et al (2015) proved that lowering the pay-performance sensitivity for low ability managers is an efficient use of information. Ample evidence with respect

to the relation between managerial ability and pay-performance sensitivity exists, and therefore, those results could be summed up as one conclusion: valuable information of CEO ability can be used in screening process as well as in updating pay-performance sensitivity.

In this sense, if CD&A disclosure followed by 2006 SEC disclosure regulation provides additional information to learn about managers' ability, then such information could also bring asymmetric change in pay-performance sensitivity after the new disclosure regulation, reflecting the value of the new information by changing previously asymmetric benchmarking in CEOs' compensation into more symmetric direction. The asymmetric change in pay-performance sensitivity between good and bad performances in post-regulation period would be greater for less able managers as pay-performance sensitivity is used in screening process of managers. Therefore, I assume that low ability managers will experience more asymmetric change in pay-performance sensitivity between good and bad performances than high ability managers:

***H3:** Firms with less able CEOs would have more asymmetry on their CEO's pay-performance sensitivity change between good performance and bad performance than firms with more able CEOs in post-regulation period.*

## III. Research Design

### 3.1. Sample Selection

I selected sample from *Execucomp* through 2000 to 2012. Table 1 Panel A shows the sample selection procedure for the test. Total firm-year CEO observations during the sample period are 24,959. I excluded data that are not listed in NYSE, NASDAQ, and AMEX as the new disclosure regulation is applied only for publicly traded firms. Following Banker et al (2013), I also excluded observations with CEOs who worked less than two consecutive years in each firm. Such elimination excludes CEOs who came to each firm for the first year, when CEOs might have empire-building incentives and have contracts with high pay-performance sensitivity with opportunism that might obscure the true result related with CEOs' ability. Since CEOs who worked less than one fiscal year cannot reveal their past performance at the current firm, I excluded such firm-year data for more robust results. Matching with the final sample with *COMPUSTAT* and *CRSP* for firm characteristics and stock return data, I obtained final firm-year observations of 18,564. Table 1 Panel B shows the distribution of observation by year. In pre-regulation period, I obtained 8,017 number of observations and in post-regulation period, I obtained 10,547 number of observations.

[Insert Table 1 here]



In order to apply difference-in difference test method, I made *POST* variable to indicate whether specific firm-year data belongs to pre-regulation period or post-regulation period. As the new regulation was effective on and after December 15, 2006, firms with fiscal year-end in December were effective in 2006 and firms with fiscal year-end in other than December were effective in 2007. Therefore, following previous studies (Gipper, 2017; Bloomfield, 2018), I assigned  $POST=1$  for firms having fiscal year-end in December starting from 2006 and firms having fiscal-year end in other than December starting from 2007. Rest of the observations are assigned  $POST=0$ .

Estimating pay-performance sensitivity for good and bad performances, I followed prior literature from Harford and Li (2007) and Wang et al (2018). I classified annual return variable (*RET*) into two classes; *NEG* and *POS*, each indicating negative return values and positive return values. If annual return (*RET*) at time *t* is negative then such observation is classified as *NEG* for that firm-year observation. If annual return at time *t* is positive then classified to *POS*. Variables of my interest are interaction terms between the types of the return (*NEG* or *POS*) and the indicator variable for post-regulation period (*POST*). The focus of this study is to investigate whether there has been a change in pay-performance sensitivity based on the new regulation, therefore, signs of coefficients of  $NEG*POST$  and  $POS*POST$  are what I will be focusing on through this examination.

### 3.2. Model Specification

The objective of this paper is to examine whether 2006 SEC compensation disclosure regulation has induced changes in managers' incentive contracts, especially in the relation between the level of pay and performance. Therefore, I conducted two different types of tests; difference-in-difference test and subsample test. Difference-in-difference test would show the overall change within the entire data set, while subsample test would show the change between specific periods, within pre- or post-regulation period each.

First, I estimate the following regression model for the entire sample period including interaction terms of  $NEG*POST$  and  $POS*POST$  :

$$\begin{aligned} \ln(\text{Compensation})_{i,j,t} = & \beta_1 \cdot NEG_{i,j,t} + \beta_2 \cdot POS_{i,j,t} \\ & + \beta_3 \cdot NEG_{i,j,t} * POST + \beta_4 \cdot POS_{i,j,t} * POST \\ & + \beta_5 \cdot POST + \beta_6 \cdot SIZE_{i,j,t} + \beta_7 \cdot MTB_{i,j,t} \\ & + \beta_8 \cdot LEV_{i,j,t} + \beta_9 \cdot LOSS_{i,j,t} + \beta_{10} \cdot LIT_{i,j,t} \\ & + \beta_{11} \cdot SALES_{i,j,t} + \beta_{12} \cdot ROA_{i,j,t} \\ & + \beta_{13} \cdot STDRET_{i,j,t} + \beta_{14} \cdot STDROA_{i,j,t} \\ & + \beta_{15} \cdot HHI_{i,j,t} + \beta_{16} \cdot \text{Log Tenure}_{i,j,t} \\ & + \beta_{17} \cdot SHROWN_{i,j,t} + \varepsilon_{i,j,t} \end{aligned} \quad (1)$$

Coefficient of my interest here would be  $\beta_3$  and  $\beta_4$ . Each interaction term denotes changes in pay-performance sensitivity for negative returns and positive returns after the new regulation implementation. As I hypothesize asymmetric changes in pay-

performance sensitivity in post-regulation period between good and bad performances, I predict  $\beta_3$  and  $\beta_4$  to have different signs.

If pay-performance sensitivity for the bad-performance decreases in post-regulation period, meaning  $\beta_3$  turns out to be negative, managers are rewarded for the negative return. Since the new disclosure regulation is expected to reduce the information asymmetry between managers and investors as well as managers and shareholders, I predict  $\beta_3$  to be positive to explain the effect of the increased information transparency in the bad performance.

Garvey and Milbourn (2006) has empirically shown the negative relation between the bad luck and pay levels of CEOs, indicating that CEOs were less penalized for the bad luck than they were rewarded for the good luck. As *NEG* contains both luck and skill components and as sensitivity of managerial skill on their pay level was symmetric, according to the result from Garvey and Milbourn (2006), I suppose the asymmetric benchmarking of CEOs pay on luck would become symmetric in the post regulation period. If the new disclosure regulation brought additional value of information afterwards, it would enhance the governance by shareholders or outside investors to monitor executives with specific details. Thereby, I assume  $\beta_3$  to be positive that the new disclosure regulation has mitigated agency problem presented in pre-regulation period.

For the pay for good-performance sensitivity, denoted as  $\beta_4$ , it could have negatively significant value if high reward for good performance has reduced after the new disclosure regulation. Likewise, I assume  $\beta_4$  to have negative value since

the new regulation is expected to make information more transparent and result in the decrease of pay-performance sensitivity for good performance through lesser needs of effort inputs from managers.

Second, for the subsample analysis, I only use *NEG* and *POS* variable to check pay-performance sensitivity for good and bad performances, respectively. The result for  $\beta_1$  and  $\beta_2$  would show whether there have been changes in pay-performance sensitivity from pre-regulation period to post-regulation period :

$$\begin{aligned}
 \ln(\text{Compensation})_{i,j,t} = & \beta_1 \cdot \text{NEG}_{i,j,t} + \beta_2 \cdot \text{POS}_{i,j,t} \\
 & + \beta_6 \cdot \text{SIZE}_{i,j,t} + \beta_7 \cdot \text{MTB}_{i,j,t} + \beta_8 \cdot \text{LEV}_{i,j,t} \\
 & + \beta_9 \cdot \text{LOSS}_{i,j,t} + \beta_{10} \cdot \text{LIT}_{i,j,t} + \beta_{11} \cdot \text{SALESG}_{i,j,t} \\
 & + \beta_{12} \cdot \text{ROA}_{i,j,t} + \beta_{13} \cdot \text{STDRET}_{i,j,t} + \beta_{14} \cdot \text{STDROA}_{i,j,t} \\
 & + \beta_{15} \cdot \text{HHI}_{i,j,t} + \beta_{16} \cdot \text{Log Tenure}_{i,j,t} \\
 & + \beta_{17} \text{SHROWN}_{i,j,t} + \varepsilon_{i,j,t} \tag{2}
 \end{aligned}$$

For the compensation variable, I used Total Compensation value from *Execucomp* that combines all salary, bonus, incentives, option grant values and restricted stock values (*TDC1*). To divide sample firms into firms with high excess compensation versus firms with low excess compensation, I followed Core et al (2008) and modeled OLS regression. (See Appendix B for details.) Disaggregating total compensation into predicted value and residual value, I adopted the residual value as excess compensation that are paid in excess of normal compensation to managers.

For the managerial ability variable, I used two measures: MA-Score and Industry-adjusted ROA. I used MA-Score (*MASCORE*) following Dermajian et al (2012). Dermajian et al (2012) used methods of two-stage regression starting from DEA measure, and regressed firm specific variables and manager specific variables on each stage of analysis. The residual value from the second stage regression model gives the measure of CEO ability that I used for the first managerial ability variable, *MASCORE*. Following Rajgopal et al (2006) and Baik et al (2011), Industry-adjusted ROA was used as well to measure CEO ability. I obtained industry-adjusted ROA (*Ind-Adj ROA*) for the prior three years for each CEO for the firm-year. I calculated ROA as income before extraordinary items divided by the average total assets for each firm and subtracted from the industry-average ROA from firms in the same two digit SIC industry. As in Rajgopal et al (2006) and Baik et al (2011), I deleted observations if there are firms fewer than 10 firms within the two-digit SIC code industry classification.

Similar to prior literatures, I used control variables for firm size (*SIZE*) measured by natural log of sales, market-to-book ratio(*MTB*), leverage(*LEV*) measured as total liability divided by total equity. Loss(*LOSS*) indicator variable is also included that equals one if earnings per share before extraordinary items on *Compustat* is less than zero. Following Baik et al (2011), Litigation risk (*LIT*) for firms in industries known for high litigation risk is included. Sales growth (*SALESG*), Return on Asset(*ROA*), standard deviation of ROA and of return for the past five years(*STD\_ROA*, *STD\_RET*), Sales concentration measured by Herfindal-Hershlifer Index(*HHI*) are

also included to control firm and industry characteristics. Logarithm of CEOs' tenure from the day each manager became CEO from the current *date* for each year (*Log\_Tenure*) and share owned by CEOs to control for the percentage holding by each CEO in each firm (*SHROWN %*) are also included to control managerial characteristics. Industry and Year fixed effects are included as well (*Industry, Year*).

### 3.3. Descriptive Statistics

Table 2 Panel A presents the descriptive statistics for years from 2000 to 2012. Each year contributes approximately 18,600 observations. The mean log total pay is 8.054 and median log total pay is 8.079. Excess compensation has mean value of 0.021 and median 0.057, which are highly small percentage of total pay. *MASCORE* has mean value of 0.008 and median -0.028, and *Ind-Adj ROA* has mean value of 0.005 and median 0.003. *NEG* has mean -10.1% and *POS* has mean of 26.1% annual return.

[Insert Table 2 Panel A here]

Panel B and Panel C of Table 2 presents the compensation distribution change around the new disclosure regulation based on excess compensation and CEO ability, respectively. Panel B shows the change in compensation distribution between high excess paying firms and low excess paying firms. Total compensation seems to have more increased in the post-regulation period for low excess paying firms than for high excess paying firms, while excess compensation (*EXCESS*) seems to decrease in the post-regulation period only for high excess paying firms. Panel C shows the

change in compensation distribution between high ability CEOs and low ability CEOs. Based on each CEO ability measure, only predicted value increases in the post-regulation period and no significant changes in the level of excess compensation. Both *NEG* and *POS* decreased in post-regulation period in Panel B and C.

[Insert Table 2 Panel B and Panel C here]

Table 3 shows the correlation matrix among variables. As presented in Table 3, total compensation is highly correlated with excess compensation and performance variables. Two measures of ability have positive and significant correlation of 22.3%, with p-value less than 5% (Baik et al, 2011).

[Insert Table 3 here]

## **IV. Empirical Results**

### **4.1. Analysis of CEO pay-performance sensitivity change**

Table 4 shows the result of the analysis of CEO pay-performance sensitivity change around the new disclosure regulation. Table 4 Column (1) shows the result for the entire sample period, from 2000 to 2012. Variables of my interest are interaction terms, *NEG\*POST* and *POS\*POST*, which show the change in pay-performance sensitivity for good and bad performances after the new disclosure regulation. Coefficient for *NEG\*POST* is positive and significant as predicted, meaning the pay-performance sensitivity for bad performance in post-regulation period has increased.

As the coefficient of *NEG* is insignificant but negative, the results show that the relation between negative return and pay level has changed toward more tightly aligned feature after the new disclosure regulation<sup>7</sup>. Meanwhile, the coefficient for *POS\*POST* is negative and significant. The negative sign denotes the decrease in the pay-performance sensitivity for good-performance, meaning less reward is given to CEOs with good performance in the post-regulation period than that in the pre-regulation period. Consistent with the assumption made in Section 2 that the new disclosure regulation might brought up better governance for shareholders and outside investors, positive change to pay-performance sensitivity for *NEG* and negative change to that for *POS* have occurred in the post-regulation period. Overall results from Column (1) support the asymmetric change in pay-performance sensitivity between good and bad performances, and therefore, the new disclosure regulation change has mitigated the asymmetric benchmarking of CEO compensation in pre-regulation period that explains the rent extraction behavior of CEOs.

In addition, coefficient of *POST* is highly significant and positive. This result is consistent with Gipper (2017) that the new disclosure regulation has increased the

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<sup>7</sup> In untabulated results regressing the type of performance with the number of options granted, the negative relation between *NEG* and total compensation in the pre-regulation period could be explained by the negative number of options granted under bad performance, consistent with the result from Garvey and Milbourn (2006). Garvey and Milbourn (2006) investigated whether the number of options granted was based on maintaining the number of option granted or the value of options granted. The results show that CEOs were granted with more options under bad luck, likely suggesting CEOs were compensated for their decreased wealth through the number of options granted under bear market. It explains the rent extraction behavior through option granting in the pre-regulation period.



CEOs' pay level in the post-regulation period<sup>8</sup>. As my result also indicates increased total pay level in post-regulation period accompanied by the change in pay-performance sensitivity, both optimal contract theory and rent extraction could be plausible to explain the overall phenomenon from Column (1).

Column (2) shows the subsample test results for pre-regulation period. The coefficient of *NEG* in pre-regulation period is insignificant and shows that CEOs' pay were not well-aligned to bad performance. Consistent with Garvey and Milbourn (2006), pay-performance sensitivity for positive return is highly significant with positive sign, explaining the asymmetric benchmarking behavior when setting CEO compensation. Namely, in pre-regulation period, CEOs' pay were highly rewarded for good performance (including good luck that is uncontrollable by CEOs), whereas less penalized for bad performance (including bad luck that is uncontrollable by CEOs, likewise). Insignificant coefficient for *NEG* explains less penalized action for bad-performance, and highly significant coefficient for *POS* explains more rewarded action for good-performance in pre-regulation period. After the new disclosure regulation, however, the rent paying behavior for bad performance has disappeared since the coefficient for *NEG* shown in Column (3) is positive and significant. The coefficient for *NEG* has turned from negative value to highly positive value, and this explains the highly positive coefficient of *NEG\*POST*. For good performance, pay-

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<sup>8</sup> Gipper (2017) explains the increase in pay level with labor market theory and additional risk imposition. Such explanations are inconsistent with the rent extraction theory since pay levels should decrease if it were to be explained by managerial power.

performance sensitivity is still positive and significant, but the magnitude has reduced after the new disclosure regulation. This represents that CEOs are less rewarded for their achievement in post-regulation period than in pre-regulation period, although the positive relation between total pay and good performance is still maintained. This phenomenon is consistent with the coefficient of *POS\*POST* in the first column.

In brief, 2006 SEC compensation disclosure regulation has possibly drove the asymmetric pay-performance change between good and bad performances since the information transparency has increased, and more valuable information (informative signal) with respect to CEOs' action (based on both effort and talent) has been revealed to the market. In this sense, I cautiously suggest that the new disclosure regulation has some effect on the alleviation of information asymmetry between agent and principal as well as agent and outside investors, reflected in the change of incentive contracts.

[Insert Table 4 here]

#### **4.2. CEO Pay-Performance change with excess compensation**

The result from Table 4 shows that CEO pay-performance sensitivity has changed after the new disclosure regulation in a way toward more symmetric benchmarking accompanied by the pay level increase. Through what mechanism such pay-performance sensitivity has changed, however, still needs to be resolved. To explain such asymmetric change in pay-performance sensitivity between good and bad

performances, following prior literatures, I presume firms with high excess-paying behaviors in pre-regulation period are controlled to be one of the reason.

I calculated mean excess pay for each firm in each period (pre- and post-regulation), within the same industry, respectively. Consequently, individual firms in each industry have its own mean excess pay value for pre- and post-regulation period. I deleted firm-year observations if the number of those observations is less than four (separately in pre- and post-regulation period) in order to reduce the dispersion when calculating mean excess pay. I then calculated the median value of the mean-excess pay, which was obtained in the previous stage, and generated dummy variable *high\_excess*. *High\_excess = 1* if the mean-excess pay is greater than the median value of the mean-excess pay in pre-and post-period, respectively; else *high\_excess = 0*. Using the dummy variable, I generated two sub-samples: one with firms paying high excess compensation and the other with firms paying low excess compensations.

Table 5 Column (1) shows the result for the entire period for firms paying high excess compensation. The coefficient of *NEG\*POST* is positive and significant. This result indicates that pay-performance sensitivity for bad performance has increased after the new disclosure regulation. It is inferable that the negatively significant coefficient of *NEG* in the pre-regulation period has (at least) partially offset in the post-regulation period. The coefficient of *POS\*POST*, on the other hand, is insignificant but negative, meaning not significant though a decrease in pay-performance sensitivity for good performance has occurred. Conclusively, only pay-performance sensitivity for bad performance in firms that paid high excess

compensation has changed significantly with the predicted direction. Such result indicates that the asymmetric benchmarking behavior for bad luck has alleviated through the new disclosure regulation.

Interestingly, the coefficient of *POST* for high excess paying firms is also positive and significant as it was in Table 4. Therefore, the overall result indicates that CEOs who work in firms that are paying excessively have faced changes in their pay packages toward higher total pay with increased risk-sharing aspects. These aspects jointly present both decrease in rent extraction behavior and increase in efficiency of CEOs' compensation contract as in optimal contract theory.

From Column (2) and (3) of Table 5, we can understand the highly positive and significant coefficient of *NEG\*POST*. The new regulation change has removed the excess paying behavior of firms for *NEG* that implies improper payment to CEOs. Coefficients for *POS* are both positive and significant in both pre- and post-regulation periods, and they are even slightly increased in the post-regulation period. Although the change in pay-performance sensitivity for *POS* has not been captured in the difference-in-difference analysis, the subsample analysis shows that pay-performance sensitivity for *POS* has increased in post-regulation period with high significance. Such change in pay-performance sensitivity in pre- and post-regulation period might present the reward for the loss of excess compensation for *NEG* has been compensated with greater sensitivity for *POS*, as is the case that could also explain the positive and significant coefficient of *POST*. Overall results reflect the changes in incentive contract by the principle after the new disclosure regulation

with enhanced information transparency.

Table 5 Column (4) shows the result for the entire period for firms paying low excess compensation. Compared to the result from Column (1), no significant changes in pay-performance sensitivity for good and bad performances have occurred. There seems to be no change in pay scheme for CEOs who work in firms that are paying less excessively in the post-regulation period, however, the coefficient of *POST* indicates that total pay level has increased in firms paying low excess compensation likewise in firms paying high excess compensation.

From Column (5) and (6) of Table 5, changes in pay-performance sensitivity for each type of the performance is identified. For *NEG*, pay-performance sensitivity has become significant from insignificant value, and for *POS*, pay-performance sensitivity has become insignificant from significant value; overall changes in each of pay-performance sensitivity show that risk-sharing aspect that CEOs have to bear has changed toward greater downside risk and less upside risk. Consequently, it is inferable for firms that paid low excess compensation in pre-regulation period that CEOs' incentive contracts might have transformed with greater fixed components and less contingent components on performance metrics, but with increase in total pay level in the post-regulation period.

[Insert Table 5 here]

### **4.3. CEO Pay-Performance change with managerial ability**

For the third hypothesis, I assume that managerial ability could be another plausible reason to explain the result from the first hypothesis (Table 4). As the new disclosure regulation requires all publicly traded firms to disclose detailed information of executives' compensation, such mandatory regulation could reveal the true ability of CEOs that were not observable (or observable with low precision) in the pre-regulation period due to asymmetric information. Holmstrom (1979) has demonstrated that the value of information in incentive contracts under moral hazard or asymmetric information is a signal with value even if it is imperfect. Holmstrom (1999) has demonstrated that CEOs' talent is one of the factor that impacts the *ex post* outcome, however, it is unobservable *ex ante* in which executives' incentive contracts are settled at the second-best solution. Banker et al (2015) has also theoretically proved that the uncertainty around managerial ability plays important role in designing incentive contracts in the presence of both moral hazard and adverse selection. Banker et al (2015) argued that the principal only has pay-performance sensitivity at her disposal to screen and incentivize agents, and they proved the optimal (efficient) way of designing pay-performance sensitivity reflected in incentive contracts is to offer lower pay-performance sensitivity contracts to low ability managers for high ability managers to select the intended type of contracts.

Table 6 Panel A shows the result of the analysis using *MASCORE* (Dermajian et al, 2012) for the measure of CEO ability. I divided the entire sample into firms with

high ability managers and firms with low ability managers, similar to what I have done for Table 5 using excess compensation dummy variable. I calculated dummy variable *MASSCORE*, and let *MASSCORE=1* if the executive in each industry-year observation has greater *MASSCORE* than the median value of such measure; else *MASSCORE=0*.

Column (1) in Table 6 Panel A shows the result of the difference-in-difference analysis with the entire period for high ability managers. Coefficient of *NEG\*POST* seems weakly significant with positive value. This result might have arisen as the negatively insignificant value of the coefficient *NEG* in the pre-regulation period has changed into positively insignificant value of the coefficient *NEG* in the post-regulation period. Coefficient of *POS\*POST* is negative but insignificant, and the coefficient of *POST* is positive and weakly significant. Overall, there seems no (or at least weak) changes in pay-performance sensitivity for both good and bad performances, indicating that high ability managers are not much affected by the new disclosure regulation.

Column (2) and (3) respectively show the result of sub-sample analysis in pre- and post-regulation periods. As explained above, coefficient of *NEG* has changed from negative sign to positive sign but it is still insignificant. Coefficient of *POS* on the other hand shows interesting result. Pay-performance sensitivity for good performance has highly increased with great significance in the post-regulation period. Such results might support that it is more efficient to offer high pay-performance sensitivity for good performance to high ability managers or that it is

better to offer incentive contracts with higher portion of contingent pay on performance to high ability managers and align their interest with shareholders' benefit as in firm value maximization (Banker et al, 2015; Holmstrom, 1999).

Column (4) in Table 6 Panel A shows the results of the difference-in-difference analysis with low ability managers from the entire period. In contrast to the result from Column (1), the coefficient for  $NEG*POST$  turns out to be positive and weakly significant as well as the coefficient for  $POS*POST$  turns out to be negative and significant in the post-regulation period. These results show that more changes in pay-performance sensitivity between good and bad performances have occurred in firms with low ability managers, possibly suggesting that low ability managers are more affected by the new disclosure regulation than high ability managers are. Coefficient of  $POST$  is also positive and highly significant. This might imply that incentive contract design for low ability managers has changed in a way with greater portion of fixed pay and with less portion of contingent pay on performance.

Results for each return ( $NEG$  or  $POS$ ) can be better explained through subsample analysis in Column (5) and Column (6). The result that pay-performance for  $NEG$  has increased in post-regulation period and  $POS$  has decreased explains the asymmetric change in pay-performance sensitivity between good and bad performance featured in Table 4. For low ability managers, it might be more efficient to offer incentive contracts with less pay-performance sensitivity for upside risk and greater pay-performance sensitivity for downside risk so that high ability managers could choose the type of contract intended by shareholders. As in pre-regulation



period, if low ability managers have high pay-performance sensitivity for good performance (greater reward for upside risk that could happen not by managerial skill but by genuine luck), it would be more difficult for the principal to screen out more able managers in the market. Through such result, we might plausibly conclude the rent extraction behavior of managers with low ability has been mitigated by the new disclosure regulation, but also incentive contract has been moved toward a more efficient design.

In sum, less competent managers are more affected by the new disclosure regulation, and thereby changes in pay-performance sensitivity in good and bad performances are more asymmetric compared to those in more competent managers. More penalized for bad performance and less rewarded for good performance indicates managerial ability or talent has become more observable in post-regulation period than in pre-regulation period. This result implies that less competent managers are tightly managed after the new disclosure regulation due to increased value of information through transparency. This might impose higher cost to less able managers (greater benefit to shareholders and outside investors) as their incentive contracts are changed to the level that is sufficient to retain current manager with less reward for risk-sharing compared to those in the absence of disclosure.

[Insert Table 6 Panel A in here]

Table 6 Panel B is the same analysis with the analysis in Panel A, but the single difference is the measure of managerial ability: *Ind-Adj ROA*. Same as the result from Panel A, the coefficient of *NEG\*POST* and *POS\*POST* in Column (1) does not explain that there occurred changes in pay-performance sensitivity for good and bad performances with high ability managers. Namely, results show that high ability managers are clearly less affected by the new disclosure regulation.

Column (2) and (3) also support the similar conclusion from Panel A that pay-performance sensitivity increase in *POS* might be indicating that the efficient type of incentive contracts would be increasing the reward for sharing upside risk to high ability managers.

Panel B Column (4) shows the result for less able managers with the entire sample. Coefficient of *NEG\*POST* became highly significant with positive value, reflecting less able managers' incentive contracts are well-aligned to bad performance in the post-regulation period. Coefficient of *POST* also supports the conclusion from Panel A in the same vein. Such results support the asymmetric change in pay-performance sensitivity revealed in Table 4. Measuring managerial ability using *Ind-Adj ROA* returns the conclusion that explains the positive change in pay-performance sensitivity of bad performance in the post-regulation period. More specifically, less able managers are highly responsible for such change in pay-performance sensitivity after the new disclosure regulation.

Column (5) and (6) show results of the sub-sample analysis. Coefficient of *NEG* shows positive change from pre-regulation period to post-regulation period. This

result might indicate low ability managers became more tightly aligned to the downside risk of their performance as the information with respect to their talent are more observable in the post-regulation period. Coefficient of *POS* is both positively significant in pre- and post-regulation period. However, the magnitude of the coefficient has decreased. Such negative change in pay-performance sensitivity indicates that low ability managers are less rewarded by sharing upside risk. From such results, I infer that the principal has changed the incentive contract toward more efficient way: lowering the pay-performance sensitivity for low ability managers.

In the presence of both moral hazard and adverse selection, as demonstrated by Banker et al (2015), changing pay-performance sensitivity that would be more attractive to high ability agent is more efficient in the perspective of contracting. Pay-performance sensitivity could screen out high ability managers from low ability managers *ex ante* (pre-contract screening) and it could incentivize each type of managers to input optimal amount of effort *ex post* (post-incentivizing). From the result of the change in pay-performance sensitivity based on the new disclosure regulation, we can also infer the new regulation change has added informative signals to the labor market as well as alleviated rent extracting behavior as compensating for the bad performance has disappeared. Therefore, managerial ability is a plausible explanation to the asymmetric change in pay-performance sensitivity around the new disclosure regulation.

[Insert Table 6 Panel B here]

## V. Additional Analysis

I further investigated how managerial ability explains the change in pay-performance sensitivity between good and bad performances based on the new disclosure regulation. Two flows of the theory explain the incentive contract design for managers (Frydman and Jenter, 2010). One is the rent extraction theory that CEOs extract informational rent from their firms and such incentive contract is not efficiently determined (Bebchuk and Freid, 2003). The other is the optimal contract theory that CEOs' compensation is determined from the managerial labor market that reflects the outside opportunities-demand and supplies-of talented CEOs (Holmstrom, 1979; Holmstrom, 1999; Holstrom, 2005).

To investigate whether such asymmetric changes in pay-performance sensitivity between good and bad performances could usefully reconcile the controversy between two theories, I regressed each type of performance (*NEG* and *POS*) on the value of excess compensation (*EXCESS*) using sub samples based on the type of managers used in the previous section.

Table 7 shows the regression result that explains the relation between excess pay and ability. Panel A is the result from using *MASSCORE* as the proxy for managerial ability, and Panel B is the result from using *Ind-Adj ROA* as the proxy for managerial ability. Both tables show that only for less competent managers are subject to the pay-performance sensitivity change both in good and bad performances. For high ability managers, no change in pay-performance sensitivity occurred in both types of performances. Therefore, it could be inferred from the result that paying

informational rent to high ability managers is plausible, while tightly managing low ability managers through greater amount of risk-sharing is a way of optimal contract. Therefore, the mechanism how CEOs' incentive contract is designed under better informational transparency seems to follow the optimal contract theory for less competent managers, whereas it seems to follow the rent extraction theory for managers that are more competent.

[Insert Table 7 here]

So far, I have investigated whether paying excess compensation to managers based on their type of ability (High or Low) is optimal under the new disclosure regulation. Still, this does not clearly conclude whether the optimal contract theory or the rent extraction theory is the sole explanation of the change in pay-performance sensitivity in the post-regulation period for different types of CEOs. Therefore, I conducted 2x2-matrix analyses and subdivided the entire sample into four groups: high ability managers in firms with high excess paying firms (*High-High*), low ability managers in firms with high excess paying firms (*High-Low*), high ability managers in firms with low excess paying firms (*Low-High*), and low ability managers in firms with low excess paying firms (*Low-Low*).

As high(low) ability managers could belong in either of firms that pay high excess compensation or of firms that pay low excess compensation, sub sample analyses on each of the four distinct group will reveal the marginal effect of firm behavior and

managerial trait has on the change in managerial incentive contracts.

Table 8 shows the result of 2x2-matrix analyses. Panel A shows that pay-performance sensitivity change in bad performance with high ability managers' incentive contracts was driven by the high excess paying firm behavior. Such improper paying behavior for *NEG* has been alleviated through the increased transparency by the new disclosure regulation as the ground for the CEOs pay needs to be disclosed in detail. Panel A suggests that increased governance of outside investors and shareholders might have caused the result as the total compensation has increased in the post-regulation period. Thus, results from Panel A explain the change in incentive contract design for high ability managers in firms that used to pay high excess compensation; those CEOs might be compensated with greater level of fixed pay in the post-regulation period, but their reward for upside risk remains.

Panel B shows the result for low ability managers working in high excess paying firms. From sub sample analyses in Tale 5 and Table 6, I have obtained results for high excess paying firms and high ability managers, respectively. If the group were more (less) affected by firms' paying behavior than individual managers' ability, then pay-performance sensitivity change of good performance would show positive (negative) direction change. Since the coefficient change using *MASCORE* for the proxy of managerial ability is negative while that using *Ind-Adj ROA* is positive, the power of the characteristics of firms or of the traits of managers differ between two analyses. On one hand, using *MASCORE* as the proxy for managerial talent, the result follows Table 6 Panel A. The decrease in pay-performance sensitivity of good

performance indicates that less able managers are less rewarded for sharing upside risk. On the other hand, using *Ind-Adj ROA* as the proxy for managerial talent, the result follows Table 5. The increase in pay-performance sensitivity of good performance indicates that firms are paying relative to their competitors in the same industry<sup>9</sup>.

Panel C and D presents the result for low excess paying firms with high and low ability managers, respectively. Panel C presents results with high ability managers in low excess paying firms. Interesting result here is that the coefficient for *POS* in the post-regulation period turned positively significant from positive but insignificant value in the pre-regulation period, using *MASCORE* as the proxy for managerial ability. This result shows that managers with high ability with less pay are revealed after the new regulation, and they might change into high pay-performance sensitivity incentive contract since employers might want to retain those CEOs in their firms<sup>10</sup>. Panel D shows the result with low ability managers in low excess paying firms. In the same vein as the previous results, low ability managers are subject to asymmetric change in pay-performance sensitivity both for good and bad performance.

[Insert Table 8 here]

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<sup>9</sup> This result might suggest that high paying firms with less competent managers have greater propensity to include RPE in their incentive contracts and use it strategically by industry. However, in this paper, I did not consider the use of RPE. Explanation of RPE use requires further research.

<sup>10</sup> CEOs revealed through Panel C might be consistent with less prominent managers from Gipper (2017). Although results do not show remarkable increase in the level of pay in post-regulation period, coefficients of *POST* are both positive and one of them is weakly positive.

## VI. Robustness Check

In order to check whether the results are robust, I tracked high excess paying firms in pre-regulation period and high (low) ability managers in pre-regulation periods to post-regulation periods. The results are shown in Table 9.

Table 9 Panel A is the result of robustness test of excess paying firms. Consistent with previous results, the coefficient for *NEG\*POST* is highly significant for both high excess paying firms and low excess paying firms. Although the result seems that there might be no difference between high excess paying firms' and low excess paying firms' behavior in the post-regulation period, the coefficient for *NEG\*POST* is much greater in high excess paying firms. Thus, the result holds when firms are tracked down in the post-regulation periods.

Table 9 Panel B and C is the result of robustness test of managerial ability. For ability measure proxy using *Ind-Adj ROA*, the result is much stronger than the previous result measured by the same variable. The results show that pay-performance sensitivity for *NEG* in the post-regulation period has highly increased and pay-performance sensitivity for *POS* in the post-regulation period has reduced in the post-regulation period, consistent with the overall results conducted previously to explain managerial ability could be an explanation for the asymmetric change in pay-performance sensitivity between good and bad performances.

[Insert Table 9 here]



## **VII. Conclusion**

I examined whether 2006 SEC compensation disclosure regulation induced changes in pay-performance sensitivity between good and bad performances in the post-regulation period. Effective on and after December 15, 2006, firms are subject to disclose explanations that are more specific and the performance metrics that would be the ground of their executives' pay. Results show that pay-performance sensitivity has changed asymmetrically in post-regulation period: pay-performance sensitivity for bad performance has increased, whereas pay-performance sensitivity for good performance has decreased. I further investigated such asymmetric changes in pay-performance sensitivity between good and bad performances from two perspectives. I reasoned high excess-paying firm behavior as one explanation, and less competent CEOs' revealed ability (talent) as the other explanation. Results are consistent with predictions. Overall results from this study suggests the result from the increase in information transparency: the new disclosure regulation has not only induced firms to reduce information rent in CEO incentive contracts for bad performance, but also changed CEO incentive contract design toward more efficient way with respect to managerial ability.

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## Appendix A. Variable Definitions

Variable	Definition
<b>Dependent variables</b>	
<i>Log(COMP)</i>	Logarithm of total compensation in sum of salary, bonus, incentives, option granted, restricted stocks granted and all other compensation (TDC1).
<i>EXCESS</i>	Residual value of decomposing total compensation into predicted compensation and excess compensation. Details in Appendix B.
<b>Test variables</b>	
<i>MASCORE</i>	Ability measure from Demerjian et al(2012), using DEA measure to obtain managerial ability by regressing firm specific and managerial specific variables on firm efficiency.
<i>Ind-Adj ROA</i>	Ability measure following Rajgopal et al (2006) and Baik et al (2011). Industry adjusted ROA prior three years subtracted from each executive-firm-year ROA by industry.
<i>NEG</i>	Stock return at time t if the return is negative, otherwise zero.
<i>POS</i>	Stock return at time t if the return is positive, otherwise zero.
<b>Control variables</b>	
<i>SIZE</i>	Logarithm of sales for each firm-year.
<i>MTB</i>	Market to book ratio measured by market value divided by total equity
<i>LEV</i>	Firm leverage measured by total liability divided by total equity
<i>LOSS</i>	Indicator variable if earnings per share excluded extraordinary income is less than zero
<i>LIT</i>	Indicator variable if the firm is in the two-digit SIC code industry for high litigation risk
<i>SALESG</i>	Sales growth variable
<i>ROA</i>	Return on Asset measured by dividing income before extraordinary item with average asset
<i>STD_RET</i>	5 years standard deviation of annual return
<i>STD_ROA</i>	5 years standard deviation of ROA
<i>HHI</i>	Herfindal-Hershlifer Index to measure sales concentration
<i>Log_Tenure</i>	CEOs tenure measured as the date became CEO to the current year
<i>SHROWN %</i>	Percent of shares owned by the CEO, options excluded

## Appendix B. OLS to obtain Excess Compensation

### Regression Analysis to obtain Excess Compensation

Independent Variables	Dependent Variable: Ln(Compensation)
Log_Tenure	0.007 (1.15)
S&P 500	0.048*** (3.01)
Log_Sales <sub>t-1</sub>	0.453*** (95.28)
Book-to-Market ratio <sub>t-1</sub>	-0.628*** (-21.51)
Annual Return <sub>t</sub>	0.198*** (15.94)
Annual Return <sub>t-1</sub>	0.136*** (13.19)
ROA <sub>t</sub>	-0.259*** (-3.09)
ROA <sub>t-1</sub>	-0.317*** (-3.93)
Intercept	4.856*** (80.42)
Industry fixed effects	Yes
Adj R <sup>2</sup>	0.4579
N	19,963

\*, \*\*, and \*\*\* indicate significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by firm.

Following Core et al (2008), excess compensation is extracted from the above OLS regression model as the residual component. Predicted value from the above model indicates the expected level of compensation at time  $t$ , whereas residual value indicates the excessive level of compensation rewarded to managers (difference between the actual amount of compensation given and the predicted amount).

**Table 1. Sample Selection procedure and distribution of observations by year**

<b>Panel A. Sample selection procedure</b>	
	firm-year observations
Total firm-years CEO data from <i>Execucomp</i> for 2000-2012	24,959
Less:	
Firm-years for not listed in NYSE, NASDAQ, AMEX	(1,885)
Firm-years where CEO was in office less than two consecutive years	(934)
Firm-years with insufficient data on <i>Compustat</i> and <i>CRSP</i>	(3,576)
Final sample of firm-years	18,564

  

<b>Panel B. Distribution of observation by year</b>		
	<b>Pre-regulation</b>	<b>Post-regulation</b>
	<b>Fiscal Year</b>	<b>Fiscal Year</b>
	<b>2000</b>	<b>2006</b>
	1042	946
	<b>2001</b>	<b>2007</b>
	1276	1458
	<b>2002</b>	<b>2008</b>
	1282	1660
	<b>2003</b>	<b>2009</b>
	1304	1678
	<b>2004</b>	<b>2010</b>
	1365	1678
	<b>2005</b>	<b>2011</b>
	1340	1646
	<b>2006</b>	<b>2012</b>
	408	1481
<b>Total</b>	<b>8017</b>	<b>Total</b>
		<b>10547</b>

**Table 2. Descriptive Statistics**

	N	Mean	Q1	Median	Q3	STD
Log(COMP)	18564	8.054	7.339	8.079	8.778	1.024
EXCESS	18564	0.021	-0.377	0.057	0.456	0.710
MASCORE	14829	0.008	-0.076	-0.028	0.046	0.141
Ind-Adj ROA	18328	0.005	-0.024	0.003	0.045	0.088
NEG	18564	-0.101	-0.142	0.000	0.000	0.178
POS	18564	0.261	0.000	0.095	0.351	0.418
SIZE	18564	7.324	6.212	7.221	8.374	1.572
MTB	18564	2.790	1.350	2.036	3.217	2.574
LEV	18564	2.405	0.613	1.194	2.352	3.512
LOSS	18564	0.163	0.000	0.000	0.000	0.369
LIT	18564	0.195	0.000	0.000	0.000	0.396
SALESG	18564	0.093	-0.015	0.072	0.170	0.220
ROA	18564	0.043	0.012	0.044	0.085	0.087
SD_ROA	18564	0.049	0.012	0.026	0.058	0.065
SD_RET	18564	0.556	0.250	0.392	0.634	0.546
HHI	18564	1.661	1.070	1.749	2.343	0.946
Log_Tenure	18564	0.110	0.069	0.090	0.123	0.077
SHROWN%	18564	1.810	0.000	0.213	1.098	4.644

See Appendix A for the variable definitions



**Panel B. Distribution of Compensation components based on excess pay level**

	High excess compensation			Low excess compensation		
	Pre-period	Post-period	Difference	Pre-period	Post-period	Difference
Log(COMP)	8.505	8.539	0.034*	7.536	7.713	0.177***
EXCESS	0.483	0.424	-0.059***	-0.403	-0.346	0.057***
PREDICT	8.104	8.113	0.098***	7.942	8.065	0.123***
NEG	-0.079	-0.107	-0.027***	-0.081	-0.111	-0.031***
POS	0.285	0.243	-0.042***	0.284	0.248	-0.036***

See Appendix A for the variable definitions.

**Panel C. Distribution of Compensation components based on CEO ability**

	High ability CEOs (MASCORE)			Low ability CEOs (MASCORE)		
	Pre-period	Post-period	Difference	Pre-period	Post-period	Difference
Log(COMP)	8.066	8.150	0.084***	7.834	8.058	0.224***
EXCESS	0.043	0.032	-0.010	-0.012	0.009	0.054
PREDICT	8.040	8.140	0.101***	7.842	8.063	0.221***
NEG	-0.091	-0.108	-0.018***	-0.129	-0.124	-0.021***
POS	0.299	0.272	-0.026**	0.303	0.2451	-0.058***

	High ability CEOs (MASCORE)			Low ability CEOs (MASCORE)		
	Pre-period	Post-period	Difference	Pre-period	Post-period	Difference
Log(COMP)	8.066	8.150	0.084***	7.834	8.058	0.224***
EXCESS	0.043	0.032	-0.010	-0.012	0.009	0.054
PREDICT	8.040	8.140	0.101***	7.842	8.063	0.221***
NEG	-0.091	-0.108	-0.018***	-0.129	-0.124	-0.021***
POS	0.299	0.272	-0.026**	0.303	0.2451	-0.058***

See Appendix A for the variable definitions.

**Table 3. Correlation Matrix**

	EX-CESS	NEG	POS	SIZE	MTB	LEV	LOSS	LIT	SALES G	ROA	SD ROA	SD RET	HHI	Log Tenure	SHR OWN %	MA SCORE	Ind-Adj ROA
Log(COMP)	<b>0.719</b>	<b>0.086</b>	<b>-0.026</b>	<b>0.632</b>	<b>0.145</b>	<b>0.142</b>	<b>-0.154</b>	<b>-0.011</b>	<b>0.083</b>	<b>0.148</b>	<b>-0.119</b>	<b>-0.099</b>	<b>0.033</b>	<b>-0.058</b>	<b>-0.266</b>	<b>0.208</b>	<b>0.134</b>
EXCESS	1.000	0.011	0.006	0.012	0.009	0.005	-0.010	<b>0.044</b>	<b>0.099</b>	-0.007	<b>0.052</b>	<b>0.048</b>	-0.010	-0.032	<b>-0.218</b>	<b>0.040</b>	-0.007
NEG	1.000	<b>0.368</b>	1.000	<b>0.091</b>	<b>0.188</b>	<b>-0.060</b>	<b>-0.297</b>	<b>-0.089</b>	<b>0.129</b>	<b>0.308</b>	<b>-0.095</b>	<b>-0.137</b>	<b>0.025</b>	<b>0.021</b>	-0.016	<b>0.036</b>	<b>0.322</b>
POS	1.000	1.000	1.000	<b>-0.100</b>	<b>0.163</b>	<b>0.021</b>	<b>-0.020</b>	0.015	<b>0.150</b>	<b>0.046</b>	<b>0.137</b>	<b>0.084</b>	0.012	-0.004	0.008	0.020	<b>0.072</b>
SIZE	1.000	1.000	1.000	1.000	<b>0.043</b>	<b>0.235</b>	<b>-0.214</b>	<b>-0.224</b>	<b>-0.009</b>	<b>0.180</b>	<b>-0.351</b>	<b>-0.273</b>	<b>0.071</b>	<b>-0.085</b>	<b>-0.153</b>	<b>0.162</b>	<b>0.121</b>
MTB	1.000	1.000	1.000	1.000	1.000	<b>0.415</b>	<b>-0.112</b>	<b>0.103</b>	<b>0.135</b>	<b>0.271</b>	<b>0.081</b>	<b>0.034</b>	0.002	<b>-0.018</b>	-0.004	<b>0.233</b>	<b>0.278</b>
LEV	1.000	1.000	1.000	1.000	1.000	1.000	<b>0.122</b>	<b>-0.137</b>	<b>-0.057</b>	<b>-0.168</b>	<b>-0.015</b>	<b>-0.034</b>	<b>0.122</b>	<b>-0.084</b>	<b>-0.086</b>	<b>-0.043</b>	<b>-0.169</b>
LOSS	1.000	1.000	1.000	1.000	1.000	1.000	1.000	<b>0.127</b>	<b>-0.224</b>	<b>-0.709</b>	<b>0.245</b>	<b>0.154</b>	-0.010	<b>-0.044</b>	<b>-0.020</b>	<b>-0.094</b>	<b>-0.652</b>
LIT	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	<b>0.048</b>	<b>-0.075</b>	<b>0.280</b>	<b>0.211</b>	<b>-0.142</b>	0.004	-0.017	<b>0.247</b>	<b>0.078</b>
SALESG	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	<b>0.269</b>	<b>0.055</b>	<b>0.114</b>	0.004	<b>0.053</b>	0.002	<b>0.147</b>	<b>0.287</b>
ROA	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	<b>-0.182</b>	<b>-0.129</b>	<b>0.019</b>	<b>0.049</b>	<b>0.042</b>	<b>0.203</b>	<b>0.940</b>
SD_ROA	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	<b>0.400</b>	<b>-0.055</b>	<b>-0.025</b>	-0.016	<b>0.115</b>	<b>-0.097</b>
SD_RET	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	<b>-0.037</b>	0.017	<b>0.026</b>	<b>0.046</b>	<b>-0.064</b>
HHI	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	<b>-0.025</b>	-0.008	-0.010	<b>0.022</b>
Log Tenure	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	<b>0.348</b>	0.003	<b>0.057</b>
SHROWN%	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	<b>-0.035</b>	<b>0.032</b>
MA SCORE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	<b>0.223</b>

See Appendix A for the variable definitions. Correlations that are significant at 5% level are presented in bold.

**Table 4. Analysis of CEO pay-performance sensitivity change**

Dependent Variable:	(1)	(2)	(3)
Log(COMP)	Entire period	Pre-regulation period	Post-regulation period
NEG	-0.106 (-1.42)	-0.086 (-1.08)	0.094* (1.88)
POS	0.089*** (3.36)	0.063** (2.27)	0.042* (1.92)
NEG*POST	0.198** (2.30)		
POS*POST	-0.067** (-2.02)		
POST	0.122*** (2.93)		
SIZE	0.457*** (46.77)	0.462*** (38.50)	0.445*** (37.19)
Market-to-Book	0.043*** (8.61)	0.052*** (7.21)	0.031*** (5.46)
Leverage	-0.015*** (-3.58)	-0.008 (-1.13)	-0.017*** (-3.95)
LOSS	-0.126*** (-4.76)	-0.077* (-1.90)	-0.145*** (-4.32)
Litigation	0.183*** (3.15)	0.223*** (2.99)	0.136** (2.12)
Sales_growth	0.104*** (2.91)	0.146*** (2.99)	0.076 (1.62)
ROA	-0.322** (-2.08)	0.090 (0.39)	-0.520*** (-2.79)
SD_ROA	0.644*** (3.97)	0.994*** (3.70)	0.405** (2.24)
SD_Return	0.089*** (5.01)	0.123*** (4.34)	0.023 (1.312)
Herfindal Index	-0.881** (-2.52)	0.301 (0.54)	-0.913** (-2.36)
log_Tenure	0.051*** (4.87)	0.041*** (2.80)	0.057*** (4.39)
Share own %	-0.033*** (-9.42)	-0.034*** (-8.06)	-0.032*** (-7.56)

Intercept	4.373*** (37.43)	4.145*** (30.23)	4.703*** (32.64)
Fixed effects Clustering	Industry & Year Firm	Industry & Year Firm	Industry & Year Firm
Adj. R2	0.507	0.485	0.538
N	18564	8017	10547

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See Appendix A for the variable definitions. \*, \*\*, and \*\*\* indicate the significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by firm.

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**Table 5. CEO Pay-Performance change with excess compensation**

Log(COMP)	Firms paying High Excess Compensation			Firms paying Low Excess Compensation		
	(1) Entire Period	(2) Pre-regulation period	(3) Post-regulation period	(4) Entire Period	(5) Pre-regulation period	(6) Post-regulation period
NEG	-0.303*** (-3.04)	-0.257** (-2.47)	-0.009 (-0.16)	0.059 (0.60)	0.019 (0.18)	0.138** (2.14)
POS	0.113*** (3.29)	0.078** (2.17)	0.093*** (4.23)	0.070** (2.20)	0.070** (2.02)	0.016 (0.52)
NEG*POST	0.287*** (2.63)			0.094 (0.82)		
POS*POST	-0.036 (-0.89)			-0.057 (-1.44)		
POST	0.174*** (4.95)			0.297*** (8.01)		
SIZE	0.460*** (68.21)	0.456*** (45.04)	0.451*** (58.33)	0.445*** (36.48)	0.450*** (32.45)	0.430*** (28.31)
MTB	0.047*** (10.64)	0.064*** (8.76)	0.032*** (7.53)	0.031*** (5.34)	0.033*** (3.95)	0.025*** (3.49)
LEV	-0.023*** (-5.72)	-0.022*** (-3.34)	-0.021*** (-6.35)	-0.004 (-0.96)	-0.003 (-0.48)	-0.003 (-0.54)
LOSS	-0.110*** (-3.86)	-0.147*** (-2.76)	-0.071** (-2.27)	-0.135*** (-4.01)	-0.092* (-1.93)	-0.161*** (-3.66)
LIT	0.213*** (5.12)	0.293*** (3.75)	0.151*** (3.46)	-0.016 (-0.21)	0.075 (0.84)	-0.081 (-0.95)

SALESG	0.098*** (2.88)	0.093* (1.68)	0.111*** (2.73)	-0.074 (-1.44)	0.005 (0.08)	-0.086 (-1.21)
ROA	-0.236 (-1.58)	-0.433 (-1.50)	-0.155 (-1.00)	-0.361* (-1.90)	-0.085 (-0.31)	-0.468** (-2.01)
SD_ROA	0.394*** (2.67)	0.443 (1.52)	0.343** (2.37)	0.235 (1.15)	0.369 (1.20)	0.010 (0.42)
SD_RET	0.086*** (4.33)	0.122*** (4.03)	0.008 (0.35)	0.039*** (1.98)	0.051* (1.68)	0.007 (0.20)
HHI	-0.832** (-2.24)	1.344 (1.63)	-0.912** (-2.04)	-0.897** (-2.21)	-0.287 (-0.36)	-0.796 (-1.42)
Log_Tenure	0.034*** (3.10)	0.019 (1.23)	0.042*** (2.98)	0.001 (0.08)	-0.006 (-0.38)	-0.002 (-0.13)
SHROWN %	0.003 (0.90)	0.000 (0.23)	0.003 (0.80)	-0.026*** (-7.66)	-0.025*** (-6.27)	-0.028*** (-6.57)
Intercept	4.638*** (48.65)	4.292*** (31.53)	4.932*** (45.43)	4.420*** (30.51)	4.210*** (25.23)	4.722*** (24.65)
Fixed effects	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year
Clustering	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R2	0.607	0.5724	0.661	0.604	0.589	0.624
N	8075	3402	4673	8335	3554	4781

See Appendix A for the variable definitions. \*, \*\*, and \*\*\* indicate the significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by firm.

**Table 6. CEO Pay-Performance change with managerial ability**

		Firms with more able managers		Firms with less able managers		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(COMP)	Entire period	Pre-regulation period	Post-regulation period	Entire period	Pre-regulation period	Post-regulation period
NEG	-0.151 (-1.33)	-0.090 (-0.74)	0.128 (1.54)	-0.127 (-1.20)	-0.150 (-1.35)	0.176** (2.28)
POS	0.063 (1.46)	0.029 (0.63)	0.076*** (2.65)	0.109*** (3.41)	0.079** (2.35)	0.042 (1.41)
NEG*POST	0.249* (1.91)			0.226* (1.85)		
POS*POST	-0.010 (-0.2)			-0.091** (-2.12)		
POST	0.123* (1.80)			0.124** (2.23)		
SIZE	0.438*** (28.09)	0.439*** (23.41)	0.423*** (22.27)	0.471*** (39.85)	0.473*** (26.24)	0.461*** (33.16)
MTB	0.034*** (5.61)	0.051*** (5.60)	0.014** (2.00)	0.045*** (6.51)	0.056*** (5.79)	0.031*** (3.56)
LEV	-0.020*** (-2.75)	-0.027** (-2.35)	-0.006 (-0.74)	-0.030*** (-5.05)	-0.038*** (-3.95)	-0.017** (-2.16)
LOSS	-0.161*** (-3.49)	-0.102 (-1.54)	-0.223*** (-3.70)	-0.044 (-1.33)	-0.022 (-0.42)	-0.072* (-1.65)
LIT	0.182** (2.18)	0.300** (2.48)	0.089 (1.00)	0.108* (1.94)	0.122 (1.54)	0.090 (1.42)

SALESG	0.209*** (3.59)	0.192** (2.43)	0.211*** (2.87)	0.092* (1.84)	0.144* (1.87)	0.040 (0.65)
ROA	-0.508** (-2.37)	-0.243 (-0.76)	-0.644** (-2.54)	-0.241 (-1.30)	0.192 (0.66)	-0.581** (-2.43)
SD_ROA	0.383* (1.79)	0.461 (1.37)	0.278 (1.21)	0.556*** (2.93)	0.927*** (2.85)	0.272 (1.23)
SD_RET	0.074*** (3.19)	0.115*** (3.31)	-0.005 (-0.20)	0.072*** (3.64)	0.106*** (3.22)	0.012 (0.55)
HHI	-1.112** (-2.27)	0.171 (0.19)	-1.434** (-2.56)	-0.033 (-0.09)	0.771 (1.03)	-0.217 (-0.42)
Log_Tenure	0.028* (1.76)	0.001 (0.06)	0.050** (2.55)	0.057*** (4.09)	0.047** (2.35)	0.064*** (3.67)
SHROWN %	-0.037*** (-8.64)	-0.035*** (-6.26)	-0.039*** (-7.28)	-0.028*** (-6.81)	-0.028*** (-5.23)	-0.028*** (-5.94)
Intercept	4.602*** (25.88)	4.465*** (20.39)	4.947*** (22.82)	4.193*** (29.33)	4.027*** (22.04)	4.527*** (25.34)

Fixed effects	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year
Clustering	Firm	Firm	Firm	Firm	Firm	Firm

Adj. R2	0.521	0.506	0.549	0.486	0.409	0.551
N	7288	3289	3999	7541	3408	4133

See Appendix A for the variable definitions. \*, \*\*, and \*\*\* indicate the significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by firm.



**Panel B. CEO Ability measure as Ind-Adj ROA**

	Firms with more able managers			Firms with less able managers		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(COMP)	Entire period	Pre-regulation period	Post-regulation period	Entire period	Pre-regulation period	Post-regulation period
NEG	-0.232 (-1.59)	-0.143 (-0.96)	-0.020 (-0.24)	-0.150 (-1.62)	-0.150 (-1.54)	0.123* (1.76)
POS	0.080** (2.06)	0.036 (0.86)	0.063** (2.17)	0.111*** (3.18)	0.090** (2.40)	0.064** (2.13)
NEG*POST	0.233 (1.38)			0.302*** (2.79)		
POS*POST	-0.042 (-0.92)			-0.063 (-1.39)		
POST	0.080 (1.36)			0.175*** (2.98)		
SIZE	0.462*** (30.32)	0.458*** (25.51)	0.454*** (24.38)	0.456*** (42.55)	0.465*** (34.20)	0.440*** (32.38)
MTB	0.032*** (4.84)	0.046*** (4.51)	0.020*** (2.66)	0.047*** (6.05)	0.059*** (5.06)	0.040*** (4.47)
LEV	-0.008 (-1.06)	-0.007 (-0.48)	-0.007 (-0.86)	-0.014*** (-2.64)	-0.006 (-0.76)	-0.017*** (-3.09)
LOSS	-0.210 (-1.28)	-0.214 (-1.13)	-0.070 (-0.20)	-0.107*** (-4.07)	-0.083* (-1.87)	-0.098*** (-3.00)
LIT	0.116 (1.44)	0.211** (2.16)	0.022 (0.24)	0.265*** (4.09)	0.293*** (3.12)	0.233*** (3.43)

SALESG	0.189*** (3.24)	0.130 (1.55)	0.257*** (3.70)	0.028 (0.65)	0.075 (1.27)	-0.007 (-0.11)
ROA	-0.443 (-1.26)	0.191 (0.40)	-1.021** (-2.45)	-0.449*** (-2.68)	-0.211 (-0.72)	-0.406** (-2.02)
SD_ROA	0.887*** (3.70)	1.046*** (2.62)	0.828*** (3.22)	0.441** (2.47)	0.639** (2.20)	0.167 (0.75)
SD_RET	0.080*** (3.11)	0.136*** (3.53)	-0.001 (-0.04)	0.061*** (2.80)	0.082** (2.38)	0.019 (0.78)
HHI	-2.566*** (-4.23)	-0.677 (-0.62)	-0.465 (-0.65)	0.089 (0.15)	1.215 (1.19)	-1.005 (-1.39)
Log_Tenure	0.055*** (3.66)	0.052** (2.46)	0.055*** (3.16)	0.053*** (3.99)	0.041** (2.23)	0.057*** (3.40)
SHROWN %	-0.036*** (-8.11)	-0.040*** (-7.24)	-0.035*** (-6.20)	-0.027*** (-6.16)	-0.028*** (-5.05)	-0.026*** (-5.13)
Intercept	4.589*** (25.17)	4.312*** (19.66)	4.704*** (21.30)	4.266*** (30.22)	4.049*** (23.31)	4.683*** (24.72)

Fixed effects	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year
Clustering	Firm	Firm	Firm	Firm	Firm	Firm

Adj. R2	0.502	0.486	0.537	0.497	0.465	0.535
N	9069	3909	5160	9259	3991	5268

See Appendix A for the variable definitions. \*, \*\*, and \*\*\* indicate the significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by firm.

**Table 7. CEO Excess compensation and ability measure**

<b>Panel A. Regress CEO Ability(MASCORE) on Excess Compensation</b>				
	(1)	(2)	(3)	(4)
	<b>Firms with more able managers</b>		<b>Firms with less able managers</b>	
Dependent variable: EXCESS	Pre-regulation period	Post-regulation period	Pre-regulation period	Post-regulation period
NEG	0.031 (0.25)	0.098 (1.18)	0.063 (0.55)	0.192** (2.50)
POS	-0.062 (-1.26)	-0.023 (-0.75)	-0.027 (-0.74)	-0.055* (-1.66)
Adj. R <sup>2</sup>	0.105	0.105	0.079	0.069
N	2768	3483	2828	3585

<b>Panel B. Regress CEO Ability(Ind-Adj ROA) on Excess Compensation</b>				
	(1)	(2)	(3)	(4)
	<b>Firms with more able managers</b>		<b>Firms with less able managers</b>	
Dependent variable: EXCESS	Pre-regulation period	Post-regulation period	Pre-regulation period	Post-regulation period
NEG	-0.086 (-0.58)	-0.031 (-0.36)	0.119 (1.18)	0.133* (1.95)
POS	-0.050 (-1.13)	-0.027 (-0.87)	-0.033 (-0.84)	-0.049 (-1.54)
Adj. R <sup>2</sup>	0.135	0.097	0.069	0.054
N	3272	4541	3297	4467

See Appendix A for the variable definitions. \*, \*\*, and \*\*\* indicate the significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by firm.

**Table 8. 2x2 Matrix format of Excess pay and CEO Ability**

Dependent variable: Ln(COMP)		MASCORE			Ind-Adj ROA		
		Entire preiod	Pre-regulation period	Post-regulation period	Entire preiod	Pre-regulation period	Post-regulation period
NEG	-0.460*** (-3.04)	-0.378** (-2.38)	-0.002 (-0.02)	-0.590*** (-3.72)	-0.625*** (-3.69)	-0.023 (-0.24)	
POS	0.037 (0.70)	-0.005 (-0.08)	0.059* (1.69)	0.077 (1.48)	0.059 (1.05)	0.063* (1.75)	
NEG*POST	0.440*** (2.59)			0.564*** (3.07)			
POS*POST	0.001 (0.01)			-0.043 (-0.70)			
POST	0.177** (2.24)			0.148** (2.23)			
Adj. R <sup>2</sup>	0.588	0.567	0.631	0.603	0.567	0.648	
N	3193	1417	1776	3943	1674	2269	

See Appendix A for the variable definitions. \*, \*\*, and \*\*\* indicate the significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by firm.

**Panel B. Firms paying high excess pay & Firms having low ability CEOs**

Dependent variable: Ln(COMP)	MASCORE			Ind-Adj ROA		
	Entire period	Pre-regulation period	Post-regulation period	Entire period	Pre-regulation period	Post-regulation period
NEG	-0.154 (-1.10)	-0.156 (-1.07)	0.069 (0.80)	-0.215 (-1.63)	-0.082 (-0.60)	0.036 (0.52)
POS	0.181*** (3.63)	0.144*** (2.81)	0.104*** (3.27)	0.139*** (2.92)	0.085* (1.69)	0.133*** (4.62)
NEG*POST	0.196 (1.26)			0.263* (1.85)		
POS*POST	-0.106* (-1.86)			-0.029 (-0.52)		
POST	0.223*** (2.93)			0.221*** (2.74)		
Adj. R <sup>2</sup>	0.582	0.500	0.665	0.604	0.563	0.645
N	2996	1303	1693	3781	1571	2210

See Appendix A for the variable definitions. \*, \*\*, and \*\*\* indicate the significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by firm.

**Panel C. Firms paying low excess pay & Firms having high ability CEOs**

Dependent variable: Ln(COMP)	MASCORE			Ind-Adj ROA		
	Entire period	Pre-regulation period	Post-regulation period	Entire period	Pre-regulation period	Post-regulation period
NEG	0.103 (0.66)	0.205 (1.14)	0.164 (1.51)	0.021 (0.10)	0.183 (0.92)	0.027 (0.24)
POS	0.097 (1.41)	0.059 (0.81)	0.067* (1.84)	0.126*** (2.28)	0.061 (1.03)	0.055 (1.33)
NEG*POST	0.044 (0.25)			0.058 (0.25)		
POS*POST	-0.035 (-0.49)			-0.074 (-1.22)		
POST	0.159 (1.59)			0.140* (1.65)		
Adj. R <sup>2</sup>	0.644	0.631	0.662	0.569	0.580	0.618
N	3058	1351	1707	3870	1598	2272

See Appendix A for the variable definitions. \*, \*\*, and \*\*\* indicate the significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by firm.

**Panel D. Firms paying low excess pay & Firms having low ability CEOs**

Dependent variable: Ln(COMP)	MASCORE			Ind-Adj ROA		
	Entire period	Pre-regulation period	Post-regulation period	Entire period	Pre-regulation period	Post-regulation period
NEG	-0.194 (-1.42)	-0.216 (-1.64)	0.074 (0.76)	0.069 (0.59)	-0.037 (-0.30)	0.222** (2.45)
POS	0.069** (2.08)	0.055 (1.65)	0.040 (0.91)	0.078* (1.91)	0.074* (1.72)	0.000 (0.01)
NEG*POST	0.226 (1.38)			0.165 (1.19)		
POS*POST	-0.031 (-0.58)			-0.089 (-1.50)		
POST	-0.050 (-0.70)			0.052 (0.70)		
Adj. R <sup>2</sup>	0.5834	0.524	0.6201	0.595	0.575	0.627
N	3417	1525	1892	3983	1726	2257

See Appendix A for the variable definitions. \*, \*\*, and \*\*\* indicate the significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by firm.

**Table 9. Robustness check**

<b>Panel A. Robustness check with subsequent behavior of excess paying firms in pre-regulation period</b>						
	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>	<b>(5)</b>	<b>(6)</b>
	<b>Firms paying High Excess Compensation</b>			<b>Firms paying Low Excess Compensation</b>		
Log(COMP)	Entire Period	Pre-regulation period	Post-regulation period	Entire Period	Pre-regulation period	Post-regulation period
NEG	-0.294** (-2.36)	-0.206 (-1.58)	0.153 (1.21)	-0.003 (-0.04)	0.018 (0.22)	0.170** (2.53)
POS	0.061 (1.13)	0.015 (0.28)	0.073 (1.42)	0.086*** (3.29)	0.079*** (2.86)	0.040 (1.259)
NEG*POST	0.435*** (2.81)			0.205** (2.18)		
POS*POST	-0.017 (-0.22)			-0.054 (-1.43)		
POST	-0.123 (-1.41)			0.179*** (4.27)		
Fixed effects	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year
Clustering	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R2	0.543	0.509	0.589	0.582	0.569	0.568
N	3065	1606	1459	12471	6411	6060

See Appendix A for the variable definitions. \*, \*\*, and \*\*\* indicate the significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by firm.



**Panel B. Robustness check with subsequent behavior of CEOs in pre-regulation period(MASCORE)**

Log(COMP)	(1)		(2)		(3)		(4)		(5)		(6)	
	Entire Period		Pre-regulation period		Post-regulation period		Entire Period		Pre-regulation period		Post-regulation period	
	Firms with more able managers						Firms with less able managers					
NEG	-0.263*		-0.252		0.455		-0.018		-0.008		0.093	
	(-1.66)		(-1.62)		(1.63)		(-0.20)		(-0.09)		(1.15)	
POS	0.053		0.041		0.137		0.079**		0.059*		0.101***	
	(1.03)		(0.78)		(0.77)		(2.56)		(1.84)		(2.99)	
NEG*POST	0.391						0.050					
	(1.31)						(0.45)					
POS*POST	0.002						-0.017					
	(0.02)						(-0.39)					
POST	0.031						0.099**					
	(0.14)						(2.12)					
Fixed effects	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year
Clustering	Exec	Exec	Exec	Exec	Exec	Exec	Exec	Exec	Exec	Exec	Exec	Exec
Adj. R2	0.517		0.488		0.696		0.470		0.439		0.497	
N	1618		1356		262		9369		5341		4028	

See Appendix A for the variable definitions. \*, \*\*, and \*\*\* indicate the significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by executives.

**Panel C. Robustness check with subsequent behavior of CEOs in pre-regulation period(Ind-Adj ROA)**

	(1)	(2)	(3)	(4)	(5)	(6)
	Firms with more able managers			Firms with less able managers		
Log(COMP)	Entire Period	Pre-regulation period	Post-regulation period	Entire Period	Pre-regulation period	Post-regulation period
NEG	0.085 (0.41)	0.101 (0.47)	0.257* (1.74)	-0.224*** (-2.65)	-0.190** (-2.17)	0.101 (1.16)
POS	-0.049 (-0.73)	-0.063 (-0.85)	0.017 (0.23)	0.104*** (3.61)	0.082*** (2.81)	0.049 (1.28)
NEG*POST	0.176 (0.75)			0.363*** (3.23)		
POS*POST	0.032 (0.43)			-0.084* (-1.72)		
POST	0.118 (1.25)			0.073 (1.50)		
Fixed effects	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year	Industry & Year
Clustering	Exec	Exec	Exec	Exec	Exec	Exec
Adj. R2	0.501	0.494	0.534	0.495	0.473	0.536
N	2848	1581	1267	10277	6305	3972

See Appendix A for the variable definitions. \*, \*\*, and \*\*\* indicate the significance respectively at the 10%, 5%, and 1% levels in two-sided tests. Numbers in parentheses are t-statistics that are based on standard errors clustered by executives

## 국문초록

# 2006 증권 거래소 공시규율 개정안이 최고 경영자의 성과-보상 민감도에 미치는 효과

임현정  
경영학과 회계학 전공  
서울대학교 대학원

본 연구는 도덕적 해이와 역선택의 문제가 모두 존재하는 상황에서 2006 증권거래소 공시규율 개정안이 최고 경영자의 성과-보상 민감도 변화에 미친 효과를 분석한다. 공시규율 개정안이 도입된 이후, 부(-)의 수익률에 대한 성과-보상 민감도는 증가한 반면 정(+)의 수익률에 대한 성과-보상 민감도는 감소하는 것으로 나타났다. 나아가 본 연구는 공시규율 개정안 이후 시점에서 성과-보상 민감도의 비대칭적 변화를 초과 보상과 경영진 능력의 두 가지 관점에서 분석하였다. 분석 결과, 공시규율 개정안 이전에 초과 보상을 지급하던 기업들과 상대적으로 역량이 낮은 최고 경영자들이 근무하던 기업들에서 비대칭적 성과-보상 민감도의 변화가 발생하는 것으로 나타났다. 본 연구의 결과는 공시규율 개정안이 최고 경영자의 보상계약에서 정보의 지대를 감소시켰을 뿐 아니라 경영진의 능력 관점에서 더욱 효율적인 보상계약으로 변화되었음을 시사한다.

**주요어** : 2006 증권거래소 공시규율 개정안, 성과-보상 민감도,  
보상계약, 경영진 능력

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