The Effects of Idiosyncratic Risk on CEO Incentives

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ABSTRACT

This paper examines the relation between idiosyncratic risk and CEO's incentives. We argue that because uncertainty results in more responsibility and power delegation to executives, firms with higher uncertainty must pay higher incentives to their executives. Consistent with our argument, we find a positive relation between idiosyncratic risk and CEO's incentives, as measured by the log of cash compensation, the log of equity compensation, the log of total compensation, and the log of pay-performance sensitivity. Our finding is unchanged when we examine the effect of idiosyncratic risk on non-CEO executives' incentives separately. Overall, our empirical results suggest that firms with higher idiosyncratic risk reward their CEOs and other executives with higher incentives.

Key Words: Executive Incentives, Idiosyncratic Risk, Uncertainty, Risk-Incentive Trade-off

I. Introduction

Executive pay has increased significantly during the past few decades. Specifically, the use of equity-based compensation has increased dramatically (Brockman et al., 2010). As a result, the median CEO compensation tripled from 1980 to 1994 (Hall and Liebman, 1998), and then doubled again from 1994 to 2000 (Bergstresser and Philippon, 2006). Such changes in compensation have drawn the attention of policy makers and academics. Despite more than two decades of research, the relation between firm risk and executive incentives remains inconclusive. Whether executive compensation incorporates the effects of idiosyncratic risk is not clear. In this context, the primary objective of this study is to investigate the role of idiosyncratic risk on CEO incentives. Specifically, we examine the effect of idiosyncratic risk on CEO incentives using an exclusive empirical model[1] along with an updated compensation dataset. The empirical results provide consistent results that managerial incentives increase with idiosyncratic risk.

Numerous studies on managerial incentives and firm risk over the past decades find mixed empirical evidence[2]. The previous empirical research uses various measures of firm risk and uses various corporate settings (Pendergast, 2002) to examine the effects of firm risk on CEO incentives[3]. The prior studies are inconsistent in defining incentives[4] and vary with the model specification across the studies[5]. Instead of single incentive measure used in prior research, we use cash, equity, total compensation, as well as pay-performance sensitivity as measures of CEO incentive and examine the effects of idiosyncratic risk on each measure.

[1] We find prior studies omit several variables while estimating the effect of risk on CEO's incentives. We address this omitted variable bias problem.

[2] For instance, Eaton and Rosen (1983), Lewellen, Loderer, and Martin (1987), Gray and Cannella (1997), Aggarwal and Samwick (1999), Aggarwal and Samwick (2002), Aggarwal and Samwick (2003), Mishra, McConaughy and Gobeli (2000), and Jin (2002) document a negative trade-off between managerial incentives and risk whereas Demsetz and Lehn (1985), Core and Guay (1999), Guay (1999), Prendergast (2000), and Prendergast (2002) find a positive relation. However, Garen (1994), Yermack (1995), Bushman, Indjejikian and Smith (1996), Ittner, Larcker, and Rajan (1997), Conyon and Murphy (2000), and Oyer and Shaefer (2005) find no relation between risk and managerial incentive. Moreover, Miller, Wiseman, and Gomez-Mejia (2002) find a curve-linear relation between risk and compensation.

[3] See Pendergast (2002) for details. Except, Core and Guay (1999) and Jin (2002), all other researchers use variability of returns as the measure of firm risk.

[4] For example, Aggarwal and Samwick (1999) define CEO's incentives as total flow compensation whereas Core and Gauy (1999) and Jin (2002) define CEO's incentives as pay-performance sensitivity. See Pendergast (2002) page 1077 for details. He summarizes prior research in Table 1. As shown in Table 1, prior researchers are not consistent in measuring idiosyncratic risk.

[5] See Jin (2002), Aggarwal and Samwick (1999) etc. They use various structural equations to test the effects of idiosyncratic risk on compensation. Their structural equations omit variables.

Moreover, prior research is inconsistent in definition and estimation of idiosyncratic risk. Since idiosyncratic risk is time-varying[6], we need a model that captures this time-varying property. Thus, following Fu (2009), Brockman, Schutte and Yu (2009), Spiegel and Wang (2006), and Eiling (2006), we employ Nelson's exponential generalized auto regressive conditional heteroskedasticity (EGARCH) model to estimate idiosyncratic risk.

We hypothesize idiosyncratic risk to have a positive effect on CEO incentives[7] for two reasons. First, the omnipresent conflict of interest between the principal and agent further augmented by informational asymmetry distorts the perception of risk giving rise to a differential risk return trade-off between the two. Therefore, CEO may prefer a different level of risk than the principal. As a result, the CEO may avoid positive net present value, projects. We, therefore, argue that since the owners cannot effectively oversee agent's activities, they must provide suitable incentives to induce the agent to take appropriate actions for the level and riskiness of the firm. Second, increasing uncertainty leads to increasing monitoring costs. Consequently, uncertainty results in increased managerial responsibility and power delegation[8]. Therefore, a firm with higher idiosyncratic risk needs to pay higher incentive to encourage managerial efforts.

We investigate the effects of idiosyncratic volatility on CEO incentive using a sample of 24,253 firm-year observations during the 18-years period from 1992 to 2009. We assume idiosyncratic risk results in increased managerial responsibility and power delegation. We, therefore, expect that firms with higher idiosyncratic risk pay higher compensation to their CEOs holding everything else equal. Following prior empirical and theoretical research on compensation, we use cash, equity and total compensation as well as pay performance sensitivity (PPS) as measures of CEO incentives. We apply several empirical methods (pooled OLS and GMM simultaneous equation estimation, the ordinary least squares, robust regression and median regression) to examine the effects of idiosyncratic risk on CEO incentives. Consistent with our hypothesis, we find that idiosyncratic risk has a positive effect on CEO incentives. Our

[6] See Fu (2009) for details.

[7] Following prior research, we measure incentives as cash, equity, total compensation, and pay-performance-sensitivity. We examine the effect of idiosyncratic risk on each measure of CEO incentive separately.

[8] We argue that firms use incentives to mitigate risk-related agency problems. Well-diversified shareholders would like managers to invest in all positive net-present-value projects irrespective of the idiosyncratic risk associated with those projects. In comparison, due to lack of diversification, risk-averse managers may choose to forgo some positive net-present-value projects that would increase firm idiosyncratic risk (Guay 1999). This condition can give rise to risk-related agency problems. Please see Prendergast (2000, 2002) for detail.

empirical results are robust to controlling for firm performance, firm characteristics, firm policies, executive characteristics, governance and external monitoring mechanism.

Our study contributes to the literature in two different ways. First, our results extend the growing literature on the impact of firm specific risk on CEO incentives. Pendergast (2000, 2002) provides theoretical evidence on the impact of uncertainty on CEO incentives. We provide empirical support for the argument that firm-specific risk results in higher CEO incentives. We also provide evidence consistent with the predictions of Core and Guay (1999). Second, we add to the growing literature that examines the relationship between CEO incentives and firm risk. Though there has been extensive research regarding CEO incentives and firm risk [(Aggarwal and Samwick, 1999, Guay, 1999, Jin, 2002)], most of the studies focus on a single measure of CEO incentive. For example, Aggarwal and Samwick, 1999 use total flow compensation whereas Core and Guay (1999) and Jin (2002) use pay performance sensitivity as measure of incentive. We contribute to the literature by investigating the impact of idiosyncratic risk on CEO incentives using cash, equity, total compensation and pay-performance-sensitivity. This approach allows us to better understand the relation between CEO incentives and idiosyncratic risk.

This paper advances as follows. In Section II, we review related research on compensation and risk. Section III discusses our sample. Section IV presents our methodologies and empirical findings, and we summarize and conclude our findings in Section V.

II. Related Research

There has been extensive empirical and theoretical research on risk and executive compensation over the past decades. Existing literature provides two opposing explanations for risk and managerial incentives. One view states that as a firm's cash flows increase in volatility, it becomes harder to monitor management, increasing the need for incentive alignment (Demsetz and Lehn, 1985). For example, if a manager faces a downside risk, he has the incentive to avoid risky projects. Thus, employee stock options provide managers with incentives that limit downside risk. This view suggests that stock option incentives will be positively related to risk. The noise in firm’s operating environment is expected to increase cost of direct monitoring which in turn increases in the relative benefits of using option incentives (Demsetz and Lehn, 1985). Moreover, uncertain environment results in the delegation of responsibility and discretion

over the activities of managers. Therefore, firms should introduce incentive pay based on output to mitigate agency-related problems when they operate in riskier environments. Thus, uncertainty and incentives are positively correlated (Prendergast, 2002). Another view is that the trade-off between risk and managerial incentives is lower in uncertain environments. Efficient contracting view suggests that pay sensitivity should be negatively related to the volatility of performance measures (Holmstrom and Milgrom, 1987). According to this view, when firms offer a pay-for-performance contract to a risk-averse agent, it imposes risk on the compensation. So the agent must be compensated for bearing additional risk, which results in higher costs for the firm. Thus, when choosing higher pay for performance, firms trade off the benefits of more effort against higher wage costs. This school suggests that in equilibrium, managerial pay should be lower in more uncertain environments[9].

Prior studies on risk and compensation have yielded mixed results. For example, Garen (1994), Yermack (1995), Bushman et al. (1996), and Ittner et al. (1997) find no significant relation; Lambert and Larker (1987), Gray and Cannella (1997), Aggarwal and Samwick (1999), Jin (2002), and Garvey and Milbourn (2003) find a negative relationship; and Core and Guay (1999) find a positive relationship between risk and managerial compensation. Prendergast (2000, 2002) theoretically shows a positive relationship between risk and managerial incentives. Guo and Ou-Yang (2006) theoretically show either a positive or a negative relationship between pay-performance sensitivity and risk may arise, depending on the agent's costs of managing mean and risk. These studies examine the relation between risk and compensation in various corporate settings. Nonetheless, quite a few studies directly examine the relation between idiosyncratic risk and CEO incentives.

Garen (1994) argues that empirical studies on executive compensation generally fail to specify a model of executive pay that could be used to base and test hypotheses regarding its determinants. He analyzes a simple principal-agent model to determine how well it explains variations in CEO incentives. His findings are consistent with the basic intuition of the principal-agent model that compensation is structured to trade off incentives with insurance. However, statistical significance for some of the effects is weak. He concludes that principal-agent considerations have an important effect on executive compensation; many issues in determining

[9] See Prendergast (2002) who provides a detailed explanation of why a large number of empirical and theoretical tests find a positive relationship between risk and managerial compensation.

CEO pay are unresolved. He uses standard deviation of residuals from a market model as the proxy for firm risk. He also uses interaction of firm risk with the total book value of firm's assets to test the effects of firm risk on executive pay.

Yermack (1995) uses the ratio of variance of annual changes in return on equity to variance of annual stock return as a measure of monitoring difficulty to test the relationship between firm noise and executive compensation. However, he finds limited evidence that firms provide greater incentive from stock options when accounting earnings contain a large amount of noise relative to stock returns.

Bushman, Indjejikian and Smith (1996) examine the use of individual performance evaluation in CEOs' annual incentive plans. They use the variance of stock returns as a measure of the noise in stock price relative to the CEO's actions. They also use beta and variance of residuals from the market model as an alternative measure of noise. They find no relation between firm risk and individual performance measured respectively as the ratio of individual performance to bonus, salary, and long term pay. Their results are not different when they use residual variance as a measure of firm risk.

Conyon and Murphy (2000) examine CEO compensation using both US and UK data. They do not find any relation between firm risk measured as variance of stock return and executive pay measured as salary, bonus and total pay. Similar result holds when they use equity-based compensation as the dependent variable in their OLS regression. They find that variance of stock return does not explain CEO's stock-based compensation.

Using variance of the annual stock return, Eaton and Rosen (1983) find negative effects of firm risk on executive salary and bonus. However, they find positive effects of firm risk on deferred compensation and option component of executive total pay. Lewellen, Loderer, and Martin (1987) examine whether design of the corporate executive pay package reflects an attempt to reduce agency costs between shareholders and managers. Using variance of monthly stock return, they find a negative effect of firm risk on the ratio of after-tax cash compensation to after-tax total compensation. Nevertheless, they find a positive effect on the ratio of after-tax stock-related compensation to after-tax total compensation.

Gray and Cannella (1997) hypothesize a positive relationship between firm risk and executive compensation and find evidence inconsistent with positive relationship. They argue that compensation arrangements may be used to mitigate agency problems by encouraging risk-

taking behavior and providing incentives for optimizing long-term performance. Contrary to their expectation, they provide evidence that higher- risk firms pay less to their executives than lower risk firms.

Most of the literature on executive compensation relies on the intuition of the principal-agent model. The key implication of the principal-agent model is that the executive's pay performance sensitivity is decreasing in the variance of the firm's performance (Aggarwal and Samwick, 1999). Aggarwal and Samwick (1999) argue that the pay-performance sensitivity decreases in the riskiness or variance of the firm's performance in most principal-agent models. They show strong empirical confirmation of this prediction using a large sample of top executives at 1,500 largest publicly traded corporations in the United States. They find the pay-performance sensitivities of CEO and non-CEO executive's decrease in the variance of their firms' stock returns. Aggarwal and Samwick (1999a) examine compensation contracts for managers in imperfectly competitive product markets. Using standard deviation of firm return as a measure of firm risk, they find that compensation is negatively related to firm risk. This result further supports their original findings.

In their reply to Core and Guay's (2002) comments, Aggarwal and Samwick (2002) conduct further tests on risk and compensation and find results consistent with their original findings. They claim that Core and Guay's conclusions about the positive relationship between compensation and firm risk are based on errors in their empirical work[10]. They argue that Core and Guay (1999) make two main errors: calculating an executive's change in firm-specific wealth (exclude the value of stock options exercised) and imposing the same sample restrictions. They claim that when they correct the errors and re-examine their original findings along with Core and Guay's findings, their original findings are robust to changes in specification. In other words, they find a negative relation between pay performance sensitivity and firm risk as predicted by principal-agent theory.

Mishra, McConaughy and Gobeli (2000) support the findings of Aggarwal and Samwick (1999). Using Altman's Z statistic as firm's business risk and the standard deviation of its stock return as a measure of overall firm specific risk, they find a negative trade-off between incentives and risk. They argue that firm risk introduced by incentive pay packages eventually limits the

[10] See Aggarwal and Samwick (2002) for details.

benefits for risk-averse CEOs. They further argue that the volatility of stock returns, and bankruptcy risk moderate the relation between the pay-performance sensitivity.

Jin (2002) examines the relation between CEO's incentive levels and their firms' risk characteristics. Assuming both shareholders and CEOs to be risk-averse, Jin (2002) shows theoretically that optimal incentive levels decrease with firm's nonsystematic risk, whether or not CEOs can trade the market portfolio. Unlike other studies, Jin (2002) breaks up risk into systematic and non-systematic components. He finds a negative relation between incentive level and nonsystematic risk while controlling for systematic risk. However, he does not find significant relation between systematic risk and incentive level while controlling for non-systematic risk. These results are consistent with Aggarwal and Samwick (1999).

Following Aggarwal and Samwick (1999) and Jin (2002), Garvey and Milbourn (2003) analyze the effect of risk on incentive pay by decomposing risk into systematic and idiosyncratic components. Using the sample of 6,488 CEO-firm years from 1992 through 1998, they find that change in CEO's wealth is negatively related to idiosyncratic risk. Their findings are consistent with Aggarwal and Samwick (1999) and Jin (2002).

Dee, Lulseged and Nowlin (2005) examine the relation between CEO compensation and risk. Using data from a sample of Internet firms from 1997 through 1999, they find that pay-performance sensitivity declines with an increase in variance of dollar return, which is consistent with Aggarwal and Samwick (1999). However, after controlling for size, they find a positive relation between risk and pay-performance sensitivity, which is consistent with the theoretical models of Prendergast (2002). Overall, Dee, Lulseged and Nowlin (2005) suggest that executive pay set up practice in Internet firms consider firm's risk profile when designing CEO compensation contracts.

Guay (1999) finds evidence in favor of the hypothesis that riskier firms provide managers with higher incentives. This evidence suggests there is a positive relation between risk and managerial compensation. He states that a manager's overall preference toward firm risk will depend on the relative magnitudes of the wealth effect and the risk-aversion effect. If the risk-aversion effect dominates, the manager will prefer to decrease the firm risk. This condition can result in risk-related agency problems. As a result, shareholders manage the convexity as well as the slope of the relation between firm performance and managers' wealth to effectively control agency conflicts between shareholders and managers. Therefore, he argues that firms provide

managers with incentives to invest in risky projects when the potential loss from forgoing valuable risk-increasing projects is greater.

Core and Guay (1999) conduct a series of empirical tests on CEO's total equity compensation and risk relationship. In contrast to the findings of Aggarwal and Samwick (1999), they find a positive relation between executive's pay performance sensitivity and firm risk. In response to Aggarwal and Samwick (2002), in their revised comment, Core and Guay (2002) claim the key assumption of Aggarwal and Samwick's (1999) analysis is that firm risk is the sole determinant of the pay-performance sensitivity, and that expected dollar return variance is the correct proxy for risk. They argue that dollar return variance is a noisy measure of variance. They claim that percent return variance is positively associated with incentives when they include market value and return variance as separate explanatory variables in their analysis using Aggarwal and Samwick (1999) data.

Prendergast (2000) provides a series of theoretical reasons for a positive relation between managerial compensation and firm risk. He claims there are reasonable influences that can cause a positive relation between risk and incentive. He also argues that there is no necessary reason for the data to reflect the clear and simple logic characterized by traditional negative trade-offs between risk and incentive. Prendergast (2002) argues that empirical work testing for a negative trade-off between risk and incentive has not had much success. He claims the data suggest a positive relationship between measures of uncertainty and incentives rather than the assumed negative trade-off. Also, he argues the existing studies fail to account for an important effect of uncertainty on incentives through the allocation of responsibility to employees. In addition, he argues that risky environment plays an important role in an executive pay setup. He claims that when firms function in uncertain environment, it is difficult to oversee managers' actions. Thus, firms with uncertainty need to delegate more responsibility to managers. Firms choose higher incentives to encourage suitable managerial efforts when they operate in risky environments[11].

Some prior empirical studies also find a curve-linear relationship between firm risk and executive pay. For example, Miller, Wiseman and Gomez-Mejia (2002) examine the effects of unsystematic and systematic risk on CEO compensation. They use total compensation as a dependent variable and use four different measures of firm risk: systematic market risk (beta),

[11] Zabojnik (1996) and Baker and Jorgensen (2003) also predict a possible positive relation between uncertainty and incentive.

unsystematic market risk (sigma), systematic income risk, and unsystematic income risk. They use five years of monthly stock price and Treasury bill data to estimate both systematic and unsystematic market risk. Subsequently, they regress quarterly firm return on assets on the quarterly average return on assets of all S&P 500 firms to estimate systematic and unsystematic income risk. In these both estimates, they use the CAPM. They find a curve-linear relation between unsystematic risk and pay mix. In other words, CEO compensation is higher for moderate unsystematic risk. Miller, Wiseman and Gomez-Mejia (2002) also find a positive relation between systematic risk and total compensation suggesting that firms pay more for bearing systematic risk.

To conclude, prior research on incentive and firm risk is inconsistent in defining incentive and firm risk, in estimating idiosyncratic risk, and vary across the studies in specification. Despite the number of published theoretical and empirical studies, we are yet to understand completely the impact of idiosyncratic risk on executive pay. Based on prior research, we may not be able to draw a definitive conclusion on the relation between idiosyncratic risk and CEO pay. This paper attempts to solve the dilemma on idiosyncratic risk and CEO compensation using recent data and exclusive empirical model. Contrary to prior studies, our empirical model includes all documented potential determinants of CEO pay in our regression model.

III. Data, Variables and Summary Statistics

A. Data Sources and Sample Selection

The main objective of this paper is to examine the effects of idiosyncratic risk on CEO compensation while controlling for the effects of other variables. Therefore, it is necessary to assemble a data set that includes firm level observations on CEO compensation, risk, firm performance, firm characteristics, firm policies, executive characteristics, proxy for external monitoring mechanism, and corporate governance to empirically test our hypothesis. We derive data from various sources. Our primary data set, executive compensation, is derived from Compustat's ExecuComp maintained by Standard & Poor's. It provides detailed information on the compensation of top five executives of S&P 500, S&P mid-cap 400, and S&P small cap 600 firms. Specifically, the ExecuComp data set includes total compensation as well as salary, bonus and other annual payment information. It also includes information on long-term compensation

such as value of option and restricted stock grants, other forms of compensation as well as the executives' holdings of their firms' stocks and stock options and executive characteristics such as executives' age and gender information for each year.

Financial information comes from COMPUSTAT annual files. We use COMPUSTAT annual files to compute firm performance, firm characteristics and firm policy variables. We also derive security price information, and risk free rate, market return and other Fama-French factors from the Center for Research in Security Prices (CRSP) and Kenneth French's website[12] respectively. We use monthly stock returns and Fama-French factor information to estimate idiosyncratic risk. Bond rating information is extracted from the Standard and Poor's rating database. The measures of governance are extracted from the Investor Responsibility Research Center (IRRC), and Professor Lucian Bebchuk's website[13]. We merge all the information from various sources with COMPUSTAT and CRSP data. The data we use for our analysis is a firm-level cross sectional unbalanced panel data set. It includes 17,526 observations on 2,354 different firms. Our sample covers fiscal years 1992 to 2009.

B. Variable Descriptions

B.1. Dependent Variable: In this study, our variable of interest is CEO incentives as measured by cash, equity, total compensation and pay-performance-sensitivity. Executive pay structure is not as simple as it was in the 1970s. Therefore, only cash compensation is unlikely to represent a reliable proxy for total executive pay (Gray and Cannella, 1997). A typical executive pay package is comprised of base salary, bonus, stock option awards, restricted stock grants, deferred compensation, retirement benefits, other long-term incentive plans, and other annual compensation. The empirical literature on executive compensation uses a wide range of specifications of executive pay to measure the relationship between managerial compensation and risk. Therefore, following prior research[14] on compensation, we use cash *(CASH_COMP)*, equity *(EQUITY_COMP)*, total compensation *(TOTAL_COMP)*, and pay-performance-sensitivity *(PPS)* as the measures of CEO incentives in our empirical tests.

[12] These data are available at < http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html >. We thank Professor French for making these data available.
[13] E-Index date is based on Bebchuk, Cohen, and Ferrell, " What Matters in Corporate Finance?", The Review of Financial Studies, Vol. 22 (2), February 2009, pp. 783-827. This data is available at < http://www.law.harvard.edu/faculty/bebchuk/data.shtml >. We thank Professor Bebchuk for making these data available.
[14] See Aggarwal and Samwick (1999), Core and Guay (1999), Jin (2002) for details.

We define *CASH_COMP* as sum of salary and bonus. *EQUITY_COMP* is the sum of stock option awards and restricted stock grant. *TOTAL_COMP* is the sum of base salary, bonus, stock option awards, restricted stock grants, deferred compensation, retirement benefits, other long-term incentive plans, and other annual compensation. Jensen and Murphy (1990) measure PPS as the change in CEO's total wealth resulting from a $1000 increase in shareholder value. Brockman, Martin, and Unlu (2010) define CEO's pay-performance sensitivity as the change in the value of CEO's stock and option portfolio in response to a 1% increase in the price of the firm's common stock[15]. PPS is the standard measure of CEO incentive used by Yermack (1995), Hall and Liebman (1998), Core and Guay (1999), Guay (1999), Cohen, Hall, and Viceira (2000), Core and Guay (2002), Jin (2002), Rajgopal and Shevlin (2002), Aggarwal and Samwick (2003), Datta, Iskandar-Datta, and Raman (2005), Aggarwal and Samwick (2006), Becker (2006), and Brockman, Martin, and Unlu (2010) in their empirical studies. We define PPS as the change in value of CEO's stock and option portfolio due to a 1% increase in the value of firm's common stock price and we follow prior literature in calculating pay-performance sensitivity.

B.2. Treatment Variables: Our variable of interest in this study is firm risk which is unique to a specific firm: idiosyncratic risk. It is independent of the common movement of the market. We estimate expected idiosyncratic volatility as standard deviation of residuals using Fama-French three-factor model with exponential generalized autoregressive conditional heteroskedasticity (EGARCH). We use thirty-six to sixty months' stock return prior to the current fiscal year ending month to estimate idiosyncratic risk.

In order to examine the relation between firm risk and executive pay, the theoretically correct variable should be the expected idiosyncratic volatility in the same period that executive pay is measured. Since idiosyncratic volatility is time varying, one period lag of idiosyncratic volatility may be an appropriate proxy for expected idiosyncratic volatility next period (Fu, 2009).

Most prior research estimate firm risk using market model, CAPM, Fama-French three factor model, variance or standard deviation of firm's stock returns. Prior researchers assume idiosyncratic volatility to be generated by a random walk process, which is proven otherwise by

[15] See Core and Guay (1999) for detail description of calculating pay-performance sensitivity.

current research[16]. Thus, residual standard deviation from a regression model may not represent the true measure of idiosyncratic risk. We, therefore, following Fu (2009), Brockman, Schutte and Yu (2009), Spiegel and Wang (2006), Eiling (2006) employ the exponential generalized autoregressive conditional heteroskedasticity (EGARCH) model to estimate idiosyncratic volatility to capture time-varying property of idiosyncratic risk. We use the following functional form to estimate idiosyncratic risk by the EGARCH (p, q) model, where $1 \leq p \leq 3$, $1 \leq q \leq 3$:

$$R_{it} - r_t = a_{it} + b_i(R_{it} - r_t) + s_i SMB_t + h_i HML_t + \varepsilon_{it}, \quad where\ \varepsilon_{it} \sim N(0, \sigma_{it}^2), \tag{1}$$

$$ln\sigma_{it}^2 = a_i + \sum_{l=1}^{p} b_{i,1}\, ln\sigma_{i,t-1}^2 + \sum_{k=1}^{q} c_{i,k} \left\{ \theta\left(\frac{\varepsilon_{i,t-k}}{\sigma_{i,t-k}}\right) + \gamma\left[\left|\frac{\varepsilon_{i,t-k}}{\sigma_{i,t-k}}\right| - \left(\frac{2}{\pi}\right)^{\frac{1}{2}}\right]\right\} \tag{2}$$

Eq. (1) describes the monthly return generating process. We estimate the conditional variance (σ_{it}^2) as specified by Eq. (2). σ_{it}^2 is a function of the past p-period of residual variance and q-period of return shocks. Permutations of p and q orders generate nine different EGARCH models. Based on the lowest Akaike Information Criteria (AIC), we choose EGARCH (1, 1) to estimate idiosyncratic volatility. We use 36 to 60 monthly observations immediately before the current fiscal year ending month[17]. Following Guay (1999), we transform monthly idiosyncratic volatility to annual idiosyncratic volatility by multiplying by the square root of the number of months in a year.

B.3. Control Variables: We follow previous empirical and theoretical studies to guide our choice of structural restrictions and control variables to examine the effects of idiosyncratic risk on CEO incentives. Specifically, we control for other risk measures such as systematic risk and bankruptcy risk, firm performance, firm policies, firm characteristics, executive characteristics, and external monitoring in this analysis. Although it is difficult to completely eliminate potential for omitted variables bias, we include all the variables suggested by prior research as the determinants of CEO incentives. Inclusion of these variables in our study is consistent with economic theory and the findings of prior research.

[16] Fu (2009) conducts a test to find whether or not idiosyncratic volatility follows a random walk process and finds that idiosyncratic volatility does not follow a random walk process. See Fu (2009) for details.

[17] To avoid a look-ahead bias, we require three years monthly stock returns to estimate idiosyncratic risk. See Fu (2009) for details.

Our control variables include: systematic risk (*SYS_RISK)* and bankruptcy risk *(ZSCORE_DUM),* stock return (*STOCK_RTN)*[18] and return on assets *(ROA)*[19], firm size (*TOTAL_ASSETS*–in log)[20], growth opportunities *(GROWTH_OPPORT)*[21], cash flows shortfall *(CASH_SHORT),* operating loss *(OPERT_LOSS),* marginal tax rates *(TAX_RATE),* dividend constraints *(DIV_CONST)*[22], advertising expenditure *(ADV_EXP/AT),* missing advertising expenditure (*ADV_MISSING*), research and development expenditure *(RD_EXP/AT),* missing research and development expenditure (*RD_MISSING*), investment expenditure *(INVEST_EXP/AT),* leverage (*LEVERAGE*), dividend yield *(DIV_YIELD)*[23], executive's age *(AGE),* dual responsibility or position *(DUALITY),* executive director *(EXE_DIR),* executive's gender *(GENDER),* executive turnover *(TURNOVER)*[24], governance *(GINDEX)* or entrenchment

[18] Several researchers including Jensen and Murphy, 1990 and Gibbons and Murphy, 1990 use stock return as firm performance on compensation research.

[19] Prior research including McGuire, Chiu and Elbing (1962), Hogan and McPheters (1980), Lewellen and Huntsman (1970), Abowd (1990) use accounting ratios such as ROA/ROE. Sloan (1993) finds the inclusion of earnings-based performance measures in executive compensation contract helps shield executives from fluctuations in firm value that are beyond the executive's control. Low (2009) uses lag return on asset (ROA) as a proxy for profitability.

[20] Smith and Watts (1992) and Core and Guay (1999) find that the optimal level of equity incentive increases with firm size. Smith and Watts (1992) argue that larger firms require more talented managers who demand higher compensation. As Murphy (1999) has pointed out, the best stylized fact regarding CEO pay is that CEO pay in higher in larger firms. Chourou et al. (2008) also find that firm size measured as the logarithm of total assets is positively related to executives' pay. Also see Rialhi-Belkaoui and Pavlik (1993), Ittner et al. (2003) , Miller et al. (2002), Ryan and Wiggins (2002), Boyd (1994), Finkelstein and Hambrick (1989), Coughlan and Schmidt (1985), Ciscel and Carroll (1980), McGuire et al. (1962), Patton (1961), and Roberts (1959).

[21] Market-to-book ratios often are used to measure a firm's growth opportunities relative to assets in place as shown by Myer's (1977). For example, Collins and Kothari (1989) and Smith and Watts (1992) argue that the difference between the market value and book value roughly represents the value of investment opportunities facing a firm. Similarly, Chung and Charoenwong (1991), Gaver and Gaver (1993), Holthausen and Larcker (1991), Kole (1997), Lewellen, Loderer, Martin (1987), low (2009) also use market-to-book ratios as proxies for growth or investment opportunities.

[22] Firm characteristics are the other important determinants of executive pay. Therefore, we include total assets as a measure of firm size *(SIZE),* growth opportunities *(GROWTH_OPPORT),* cash flow shortfall *(CASH_SHORT),* net operating loss *(OPERAT_LOSS),* marginal tax rates *(TAX_RATE),* and dividend constraints *(DIV_CONST)* to control the impact of firm characteristics on CEO pay.

[23] To control the effect of firm policy variables, we include dividend constraints *(DIV_CONST),* advertising expenditure *(ADV_EXP/AT),* research and development expenditure *(RD_EXP/AT*, investment expenditures *(INVEST_EXP/AT),* leverage (*LEVERAGE*), dividend yield *(DIV_YIELD)*. Baker and Wurgler (2006) mention that non-dividend-paying stocks are harder to value than dividend-paying stocks and dividend-paying firms possibly have lower uncertainty and thus may be related to lower incentives. Alternatively, following Gauy (2000), we construct a firm policy factor (*FIRM_POLICY)* to control for firm policy.

[24] Executive characteristics are very important determinants of executive pay. To control the impact of these characteristics, we include executive's age *(AGE),* age squared *(AGE2),* dual responsibility *(DUALITY),* executive director *(EXE_DIR),* gender *(GENDER),* and turnover *(TURNOVER).*

index *(EINDEX)*[25], and dummy variables for firms with S&P credit ratings (*RATE DUM*)[26]. We provide more detailed definitions as well as data sources for all control variables in Appendix A.

C. Summary Statistics and Correlations

Our sample includes 24,253 firm year observations during 1992 to 2009 for all dependent and independent variables except for the pay-performance-sensitivity. There are only 17,526 firm year observations for pay-performance-sensitivity because we lost data due to unavailability of option data.

In Table I, we present summary statistics for our dependent and right-hand side variables used in our estimations. The average CEO Cash compensation is $1049.30 thousand with median of $757.70 thousand, equity compensation is $2098.50 with median pay of $14.23 thousand, and total compensation of $3763.60 thousand with median value of $1849.17 thousand during our sample period. The equity-based compensation has a larger mean but a smaller median than the cash compensation because equity compensation has a wider range across firms than cash compensation and some of the CEOs have extremely large amount of equity compensation. Similarly, the average CEO pay-performance-sensitivity in our sample is $59.58 thousand with median PPS being $32.69 thousand. The average standard deviations of our dependent variables are very high. PPS, for instance, has a standard deviation of 60.92%. Therefore, we use natural logarithm transformations of the dependent variables in our empirical tests.

<Insert Table I here>

Table I also presents summary statistics for our treatment variable: idiosyncratic risk and control variables. The average annualized idiosyncratic volatility in our sample is 33.8% with a standard deviation of 17.82%. For the period of 1992-2009, the average annual stockholder return was 9.70% and median value was 4.40% with a standard deviation of 42.10%. On average, firm size measured by total assets is $5,794 million with median value of 1,352 million. The average CEO's age is 53.82 years with a standard deviation of 8.01%. Average turnover is

[25] We include governance *(GINDEX)* or entrenchment index *(EINDEX)* to control the impact of corporate governance on executive pay.
[26] We include indicator variables for firms with S&P ratings *(RATE_DUM)* as bond rating characteristic to control the effect of external monitoring mechanism on compensation.

.11 years with a standard deviation of 28.05%. The average leverage is 53.30% with median value of 54.90% and standard deviation of 21.2%. In Table I, we also present means and standard deviations, as well as the minimum, maximum, 25th, 50th, and 75th percentiles of dependent and independent variables. We find considerable variation for the dependent as well as for the independent variables.

Table II examines the pairwise correlations of our dependent and independent variables. Idiosyncratic risk has positive coefficient for equity compensation and pay-performance sensitivity but a negative coefficient for cash and total compensation. These results indicate that idiosyncratic risk is positively related to CEO equity pay and pay-performance sensitivity but negatively related to cash and total compensation.

<Insert Table II here>

As shown in Table II, systematic risk has a negative coefficient for cash and positive coefficients for equity, total pay and pay-performance sensitivity. Another measure risk *ZSCORE_DUM* has positive coefficients for all measures of compensation indicating that firms with higher bankruptcy risk pay higher pay to their CEOs. Turning to firm performance variables, *ROA* has positive coefficient for all measures of compensation whereas *STOOCK_RETURN* positive coefficient for cash, total, and pay-performance sensitivity but a negative coefficient for equity compensation. Firm size measured as *TOTAL_ASSETS* has positive coefficients for all measures of compensation indicating that firm size is positively related to CEO pay. The correlation coefficient between *ROA* and *GROWTH_OPPORT* is .54 which is the highest correlation between independent variables. The highest correlation among the independent variable is .54. Therefore, correlation analysis results indicate that our independent variables do not suffer from multi-colinearity problem.

IV. Estimation Methods and Results

In this section, we develop the methodology to estimate the effects of idiosyncratic volatility on CEO compensation. This study examines the link between idiosyncratic volatility and CEO compensation by answering several interrelated questions, including the following: (a) Does our pay-performance set up incorporate the effects of idiosyncratic volatility? (b) How does idiosyncratic risk affect CEO pay? To address these concerns, we have developed the

methodology in the following sections. In this section, we also present and analyze the main findings of our test results on the effects of idiosyncratic volatility on CEO compensation.

A. CEO Incentives and Risk Regression

A.1 Pooled Cross-sectional, Time-Series Analysis

Our main goal is to estimate the effects of idiosyncratic volatility on CEO compensation. In estimating the effect of idiosyncratic risk on compensation for CEO *i* working at firm *j* in the year *t*, we estimate pooled cross-sectional, time series regression as follows:

$$LCOMP_{i,j,t} = \alpha_0 + \alpha_1\, Idiosyncratic\ Risk_{j,t} + \alpha_2 Control\ Variables_{i,t} + \varepsilon_{i,j,t} \qquad (3)$$

Where, $LCOMP_{i,j,t}$ is the log of CEO's incentives measured as cash, equity, total compensation, and pay-performance sensitivity, *i* denotes CEO, *j* denotes firm, *t* denotes fiscal year, and ε_{it} is the error term. All the measures of compensations are in logs.

We include several control variables in our estimation. These variables include other risk variables, firm performance, firm characteristics, firm policies, executive characteristics, and the indicator variable for external monitoring. We include year dummies to control for time-specific variation in CEO compensation. As documented by the prior literature, CEO compensation has increased tremendously during the past few decades. We include industry dummies measured using Fama-French 48 industry classifications to control for the significant variation in CEO pay across industries. We provide the more detailed definition of the dependent and explanatory variables in Appendix A. When we include all control variables, we can re-write Eq. (3) as follows:

$$\begin{aligned} LCOMP_{i,j,t} = {} & \alpha_0 + \alpha_1 IDIO\_RISK_{j,t} + \alpha_2 SYS\_RISK_{j,t} + \alpha_3 ZSCORE\_DUM_{j,t} + \alpha_4 ROA_{j,t} + \\ & a_5 STOCK\_RET_{j,t} + \alpha_6 LASSETS_{j,t} + \alpha_7 GROWTH\_OPPORT_{j,t} + \alpha_8 CASH\_SHORT_{j,t} + \\ & \alpha_9 OPERT\_LOSS_{j,t} + \alpha_{10} TAX\_RATE_{j,t} + \alpha_{11} DIV\_CONST_{j,t} + \alpha_{12} ADV\_EXP/AT_{j,t} + \\ & \alpha_{13} ADV\_MISSING_{j,t} + \alpha_{14} RD\_EXP/AT_{j,t} + \alpha_{15} RD\_MISSING_{j,t} + \alpha_{16} INV\_EXP/AT_{j,t} + \\ & {}_{17} LEVERAGE_{j,t} + \alpha_{18} DIV\_YIELD_{j,t} + \alpha_{19} AGE_{j,t} + \alpha_{20} DUALITY_{j,t} + \alpha_{21} EXE\_DIR_{j,t} + \\ & \alpha_{22} GENDER_{j,t} + \alpha_{23} TURNOVER_{j,t} + \alpha_{24} RATE\_DUM_{j,t} + \alpha_{25} INDUSTRY_j + \alpha_{26} YEAR_t + \varepsilon_{i,j,t} \end{aligned} \qquad (4)$$

The model presented in Eq. (4) is our benchmark model to explore the role of idiosyncratic risk on CEO's compensation. First, using Eq. (4), we estimate the direct impact of

the idiosyncratic risk on CEO compensation using the Ordinary Least Squares (OLS) regression. Following prior research, we also estimate the effects of idiosyncratic risk using robust and median regressions.

We are interested in the sign of parameter estimates and the level of significance. A positive parameter indicates a positive relationship whereas a negative parameter indicates a negative relationship. According to our hypothesis, we expect *IDIO_RISK* to have a positive effect on CEO compensation.

Table III presents the estimated coefficients and standard errors obtained from the OLS regression of equation (4). CEO incentives are measured in four different ways: the log of cash compensation (Column 1), the log of equity compensation (Column 2), the log of total compensation (Column 3), and the log of pay-performance sensitivity (Column 4). *IDIO_RISK* has a positive and statically significant coefficient on all four measures of CEO incentives. For instance, the estimated coefficients on *IDIO_RISK* for column 1-4 are .32, .95, .45 and .41 respectively and all of them are significant at 1% level. These results support our hypothesis that CEO pay is positively related to idiosyncratic risk. In other words, these results indicate that a firm with higher idiosyncratic risk pays its CEO, on average, more than a firm with smaller idiosyncratic risk.

<Insert Table III here>

We also evaluate the economic significance of our findings. According to Column (1) of Table III, if idiosyncratic risk goes up by one standard deviation, .17, the log of CEO cash compensation increases by .173*.32 = .0554, which translates to about 5.54 % of increase in the level of cash compensation. Therefore, if we start at the median CEO cash compensation of $757.70 thousand, the cash compensation increases by about $41.94 thousand, an economically significant amount. If idiosyncratic risk increases by one standard deviation, .173, the CEO's equity-based pay goes up by about 16.44%, total pay goes up by about 7.79%, and pay-performance sensitivity increases up by about 7.09%. In summary, the impact of idiosyncratic risk on CEO compensation is economically significant.

Besides our main variable of interest, we also include *SYS_RISK* and *ZSCORE_DUM* to control the effects of systematic risk and bankruptcy risk on CEO's compensation. Estimation results show mixed results. For instance, *SYS_RISK* has a negative and statistically significant

coefficient for the column 1, positive and statistically significant coefficient for the column 2 and 4, and a positive but insignificant coefficient for Column 3 indicating that *SYS_RISK* has a negative impact of CEO cash compensation, positive effects on equity compensation and pay-performance sensitivity, and no effects on total compensation. Similarly, *ZSCORE_DUM* has positive effects on cash, equity and total compensation but no effect on pay-performance sensitivity.

As shown in Table III, *ROA* has positive and statistically significant coefficients on all specifications. Similarly, *STOCK_RETURN* has positive and statistically significant coefficients in all specifications except for the equity compensate. These results indicate both market and accounting measures of firm performance are positively related to CEO's incentives. This is consistent with the positive relation between CEO pay and firm performance as documented by the literature.

Firm characteristics are other important determinants of CEO's incentives. Firm size measured as *LASSETS* has a strong impact on all four measures of CEO compensation. A larger firm pays its CEO, on average, more than a smaller firm, which is consistent with the literature. *GROWTH_OPPORT*[27] has positive and statistically significant coefficients in all specifications except for cash compensation. On average, a CEO in high-growth firms earns a lower cash compensation but higher equity compensation, total compensation and pay-performance sensitivity.

According to Table III, firm characteristics and CEO's characteristics are other important determinants of their incentives. For instance, firms with higher advertising expense and research and development expense pay higher compensation. We do not tabulate results for CEO characteristics due to space constraints. Positive and statistically significant coefficients on *EXE_DIR* indicate that being the chairman has a significant and positive impact on CEO compensation. Gender does not have a significant impact on CEO pay. On average, an older CEO earns higher cash and total compensation but lower equity pay. CEO age does not have a significant impact on CEO pay-performance sensitivity.

[27] The positive association between CEO's incentives and growth opportunities is consistent with findings of Smith and Watts (1992) and Palia (1998).

In Table IV, we report the median regression results[28]. As Aggarwal and Samwick (1999) argue, median regression minimizes the sum of absolute deviations rather than the sum of squared deviations. If the measures of CEO pay are skewed in the sample, the estimated pay will be smaller for the median than for the mean. Moreover, the median is a more robust measure of the center of the data than the mean, the precision of the estimates will also increase. Therefore, following Aggarwal and Samwick (1999) and Jin (2002), we examine the effects of idiosyncratic risk on CEO incentives using median regression. Our regression results support our hypothesis by showing positive and highly significant estimated coefficients on *IDIO_RISK* in all specifications. These results suggest that firms with higher idiosyncratic risk pay higher compensation to their CEOs.

<Insert Table IV here>

According to Table IV, *IDIO_RISK* has a positive and statically significant coefficient on all four measures of CEO incentives. As shown in the table, if idiosyncratic risk increases by one standard deviation, .173, the CEO's cash compensation increases by about 9.17% (.173*.53), equity-based pay goes up by about 23.18%, total pay goes up by about 9.69%, and pay-performance sensitivity increases up by about 3.63%. When we use median regression, the explanatory power of idiosyncratic risk increased significantly for cash, equity and total compensation. However, the explanatory power of idiosyncratic risk for pay-performance sensitivity decreases from 7.09% in the OLS regression to 3.63% in median regression. Overall, the impact of idiosyncratic risk on CEO compensation is economically significant in our median estimations.

In Table V, we report the robust regression[29] results. Following research on compensation, including Jin (2002), we examine the effects of idiosyncratic risk on CEO incentives using robust regression. Again, robust regression results support our hypothesis by

[28] Prior research on compensation including Aggarwal and Samwick (1999) and Jin (2002) median regression to estimate the effects of firm risk on CEO's incentives. Median regression minimizes the sum of absolute deviations instead of the sum of squared deviations so that the precise value of the dependent variable in a median regression matters only in determining whether the observation has a positive or negative residual (Aggarwal and Samwick, 1999). If the residual is positive or negative, the dependent variable can increase toward infinity without affecting the estimated parameters (Jin, 2002). See Koenker and Bassett (1982) for detail properties of median regression.

[29] Robust regressions are used to deal with outlier effects. Prior research including Hall and Liebman (1998) and Jin (2002) use robust regression. A robust regression eliminates gross outliers, and minimizes a weighted sum of squared errors to perform regression. Please see Street, Carroll and Ruppert (1988) for details.

showing positive and highly significant estimated coefficients on *IDIO_RISK* in all specifications. For example, the estimated coefficients of *IDIO_RISK* are .07, 1.51, .51 and .36 for CEO's cash, equity, total compensation, and pay-performance sensitivity respectively. These results reaffirm our findings in Table III and IV suggesting a positive relation between idiosyncratic risk and CEO's incentives.

<Insert Table V here>

As presented Table V, if idiosyncratic risk increases by one standard deviation, .173, the CEO's cash compensation increases by about 1.21% (.173*.07), equity-based pay goes up by about 26.12%, total pay goes up by about 8.82%, and pay-performance sensitivity increases up by about 6.23%. When we use robust regression, the explanatory power of idiosyncratic risk increased significantly for equity, total compensation and pay-performance sensitivity. However, the explanatory power of idiosyncratic risk for cash compensation decreases, which is still economically significant. In conclusion, the impact of idiosyncratic risk on CEO compensation is economically significant in our robust estimation.

Jin (2002) argues that the rank measure risk can make the highly nonhomogeneous data more homogenous and make the regression result more economically sensible. He also argues that we can easily transform the regression coefficients into pay–performance sensitivities at any percentile of the distribution of risk. Therefore, following Aggarwal and Samwick (1999), Bertrand and Mullainathan (2000), and Jin (2002), we estimate the effect of rank risk on CEO's incentives.

<Insert Table VI here>

In Table VI, we present the OLS estimation results. The coefficients on *RANK-_IDIO_RISK* remain positive and statistically significant in all our specifications reaffirming our original finding. Thus, our findings are consistent with our main hypothesis that *IDIO_RISK* has positive effects on the CEO's incentives.

A.2. Generalized Method of Movements (GMM) Estimation

If CEO's compensation and idiosyncratic risk are jointly determined, then ordinary least square estimation can lead to a biased coefficient for idiosyncratic risk. To address this concern, in this subsection, we estimate a system that models compensation and idiosyncratic risk as jointly endogenous. Our two-equation systems are specified as follows:

$$IDIO\_RISK_{j,t} = \alpha_0 + \alpha_1 LCOMP_{i,j,t} + \alpha_2 SYS\_RISK_{j,t} + \alpha_3 ZSCORE\_DUM_{j,t} + \alpha_4 ROA_{j,t} + a_5 STOCK\_RET_{j,t} + \alpha_6 LASSETS_{j,t} + \alpha_7 GROWTH\_OPPORT_{j,t} + \alpha_8 CASH\_SHORT_{j,t} + \alpha_9 OPERT\_LOSS_{j,t} + \alpha_{10} TAX\_RATE_{j,t} + \alpha_{11} DIV\_CONST_{j,t} + \alpha_{12} ADV\_EXP/AT_{j,t} + \alpha_{13} ADV\_MISSING_{j,t} + \alpha_{14} RD\_EXP/AT_{j,t} + \alpha_{15} RD\_MISSING_{j,t} + \alpha_{16} INV\_EXP/AT_{j,t} + {}_{17} LEVERAGE_{j,t} + \alpha_{18} DIV\_YIELD_{j,t} + \alpha_{19} AGE_{j,t} + \alpha_{20} AGE2_{j,t} + \alpha_{21} DUALITY_{j,t} + \alpha_{22} EXE\_DIR_{j,t} + \alpha_{23} GENDER_{j,t} + \alpha_{24} RATE\_DUM_{j,t} + \varepsilon_{j,t} \quad (5)$$

$$LCOMP_{i,j,t} = \alpha_0 + \alpha_1 IDIO\_RISK_{j,t} + \alpha_2 SYS\_RISK_{j,t} + \alpha_3 ZSCORE\_DUM_{j,t} + \alpha_4 ROA_{j,t} + a_5 STOCK\_RET_{j,t} + \alpha_6 LASSETS_{j,t} + \alpha_7 GROWTH\_OPPORT_{j,t} + \alpha_8 CASH\_SHORT_{j,t} + \alpha_9 OPERT\_LOSS_{j,t} + \alpha_{10} TAX\_RATE_{j,t} + \alpha_{11} DIV\_CONST_{j,t} + \alpha_{12} ADV\_EXP/AT_{j,t} + \alpha_{13} ADV\_MISSING_{j,t} + \alpha_{14} RD\_EXP/AT_{j,t} + \alpha_{15} RD\_MISSING_{j,t} + \alpha_{16} INV\_EXP/AT_{j,t} + {}_{17} LEVERAGE_{j,t} + \alpha_{18} DIV\_YIELD_{j,t} + \alpha_{19} AGE_{j,t} + \alpha_{20} DUALITY_{j,t} + \alpha_{21} EXE\_DIR_{j,t} + \alpha_{22} GENDER_{j,t} + \alpha_{23} RATE\_DUM_{j,t} + \alpha_{24} INDUSTRY_j + \alpha_{25} YEAR_t + \varepsilon_{i,j,t} \quad (6)$$

Where, *LCOMP* is the log of CEO's incentives measured as cash, equity, total compensation and pay-performance sensitivity. All the incentives measures are in logs. We provide the details definition of both dependent and independent variables in Appendix A.

We rely on earlier empirical studies to guide our selection of instrument and right-hand-side variables in our simultaneous equations. Prior studies find that managerial compensation influences managerial risk-taking behavior[30]. For example, Guay (1999) shows that firm size, leverage, investment opportunities are important determinants of firm risk.

<Insert Table VII here>

We estimate the predicted value of *IDIO_RISK* using equation (5) and use the predicted value of *IDIO_RISK* to estimate the effects of idiosyncratic risk on CEO's incentives using equation (6). Table VII reports the estimated coefficients and standard errors. Estimated

[30] For example, Haugen and Senbet (1981), Smith and Stulz (1985), and others argue that executive stock options can encourage managerial risk-taking because increases in stock return volatility increase the value of the options. John and John (1993) and Parrino and Weisbach (1999) find evidence that suggests option-based compensation may increase risk-taking. However Carpenter (2000), Ross (2004), and Hanlon, Rajgopal, and Shevlin (2004) find no such relation. In a most recent paper, Dunham (2012) finds a negative and statistically significant relationship between firm risk and the proportion of CEO total shareholdings that are unrestricted and this negative relationship holds for alternative measures of firm risk.

coefficients on *IDIO_RISK_HAT* are positive, much larger and statistically significant in all specifications. These results again support our main findings that *IDIO_RISK* positively affects CEO's incentives. Thus, GMM results also confirm our earlier estimation results and reaffirm a positive relation between CEO's incentives and idiosyncratic risk.

A.3. Instrumental Variable (IV) Estimation

IDIO_RISK may be endogenous, i.e. the magnitude of CEO compensation and *IDIO_RISK* may be jointly determined. If some omitted factors affect CEO compensation and *IDIO_RISK* in the same direction, an OLS estimation of CEO compensation on *IDIO_RISK* will generate a positive impact of *IDIO_RISK* on CEO compensation, which will be spurious. A concern of causality may also arise since *IDIO_RISK* can be influenced by CEOs. For example, if a CEO has a large amount of stock options, he has an incentive to take on risky projects resulting higher idiosyncratic risk.

In general, omitted or unobservable firm-level characteristics would be a concern for endogeneity. The generalized methods of moments approach addresses only simultaneity problems but not the endogeneity problems resulting from the omitted variables and measurement error (Wooldridge, 2009). Therefore, to address endogeneity issue, we adopt the instrumental variable regressions approach[31]. A valid instrument variable for idiosyncratic risk needs to satisfy two conditions: it determines the idiosyncratic risk, but it is not correlated with the residual in the regression of CEO compensation. The first condition is directly testable, while the second is not.

Jin (2002) states that individual firm risk measures could be treated as the independent variables and industry average risk measures as instrumental variables. Therefore, following Jin (2002), we use industry average idiosyncratic risk as the instrumental variable. According to Jin (2002), the instrumental variable approach is more sensible when there is a possibility of endogeneity of risk measures, given that CEOs might choose their firms' risk levels in response to the incentive schemes they are offered[32]. As documented in Jin (2002), industry average risk is

[31] See Ryan and Wiggins (2002) and Jin (2002) for details.
[32] See Greene (2011) for a detailed discussion of the use of the instrumental variable approach to deal with measurement errors and endogeneity of variables.

a strong determinant of idiosyncratic risk. We verify that industry average idiosyncratic is indeed a strong determinant of idiosyncratic risk in our sample.

We implement the instrumental variable regression by using the 2SLS (two-stage least squares) procedure in Stata (Wooldridge, 2009). In the first stage, *IDIO_RISK* is regressed onto the instrumental variable and control variables of Equation (7); in the second stage, the CEO compensation is regressed onto the instrumented idiosyncratic risk and control variables. The estimation equations are specified as follows:

$$IDIO\_RISK_{j,t} = \alpha_0 + \alpha_1 INSTRUMENT_{,j,t} + \alpha_2 SYS\_RISK_{j,t} + \alpha_3 ZSCORE\_DUM_{j,t} + \alpha_4 ROA_{j,t} + a_5 STOCK\_RET_{j,t} + \alpha_6 LASSETS_{j,t} + \alpha_7 GROWTH\_OPPORT_{j,t} + \alpha_8 CASH\_SHORT_{j,t} + \alpha_9 OPERT\_LOSS_{j,t} + \alpha_{10} TAX\_RATE_{j,t} + \alpha_{11} DIV\_CONST_{j,t} + \alpha_{12} ADV\_EXP/AT_{j,t} + \alpha_{13} ADV\_MISSING_{j,t} + \alpha_{14} RD\_EXP/AT_{j,t} + \alpha_{15} RD\_MISSING_{j,t} + \alpha_{16} INV\_EXP/AT_{j,t} + {}_{17} LEVERAGE_{j,t} + \alpha_{18} DIV\_YIELD_{j,t} + \alpha_{19} AGE_{j,t} + \alpha_{20} AGE2_{j,t} + \alpha_{21} DUALITY_{j,t} + \alpha_{22} EXE\_DIR_{j,t} + \alpha_{23} GENDER_{j,t} + \alpha_{24} RATE\_DUM_{j,t} + \varepsilon_{j,t} \quad (7)$$

$$LCOMP_{i,j,t} = \alpha_0 + \alpha_1 INSTRUMENTED\_IDIO\_RISK_{j,t} + \alpha_2 SYS\_RISK_{j,t} + \alpha_3 ZSCORE\_DUM_{j,t} + \alpha_4 ROA_{j,t} + a_5 STOCK\_RET_{j,t} + \alpha_6 LASSETS_{j,t} + \alpha_7 GROWTH\_OPPORT_{j,t} + \alpha_8 CASH\_SHORT_{j,t} + \alpha_9 OPERT\_LOSS_{j,t} + \alpha_{10} TAX\_RATE_{j,t} + \alpha_{11} DIV\_CONST_{j,t} + \alpha_{12} ADV\_EXP/AT_{j,t} + \alpha_{13} ADV\_MISSING_{j,t} + \alpha_{14} RD\_EXP/AT_{j,t} + \alpha_{15} RD\_MISSING_{j,t} + \alpha_{16} INV\_EXP/AT_{j,t} + {}_{17} LEVERAGE_{j,t} + \alpha_{18} DIV\_YIELD_{j,t} + \alpha_{19} AGE_{j,t} + \alpha_{20} DUALITY_{j,t} + \alpha_{21} EXE\_DIR_{j,t} + \alpha_{22} GENDER_{j,t} + \alpha_{23} RATE\_DUM_{j,t} + \alpha_{24} INDUSTRY_j + \alpha_{25} YEAR_t + \varepsilon_{i,j,t} \quad (8)$$

Where, *LCOMP* is the log of CEO's incentives measured as the log of cash, the log of equity, the log of total compensation and the log of pay-performance sensitivity. All the incentives measures are in logs. We provide the details definition of both dependent and independent variables in Appendix A.

Following Jin (2002) we use industry average idiosyncratic risk as an instrument in our instrumental variable regression. After each instrumental variable regression, we test the null hypothesis that all the instrument variables are uncorrelated with the error term. If the null hypothesis is rejected for the instrument, then we do not consider the instrument to be valid. Since we fail to reject the null hypothesis, our instruments satisfy the condition of orthogonality with the error process (Wooldridge, 2008). We conduct Durbin-Wu-Hausman test of endogeneity to find whether or not our instrument is strong. The Durbin chi-squared values are 16.53 (p-value 0.00), 42.64 (p-value 0.00), 17.27 (p-value 0.00), and 34.28 (p-value 0.00)

respectively in all specifications rejecting the null hypothesis of exogeneity of dependent variables. These tests provide indirect evidence that the instrument is valid.

<Insert Table VIII here>

Table VIII presents the estimated coefficients and standard errors obtained from the instrumental variable regression of CEO compensation. Again, our basic findings remain unchanged supporting our main hypothesis that idiosyncratic risk has a positive effect on CEO's incentives. With the instrumental variable regression approach, the estimated coefficients for *IDIO_RISK* are improved significantly and are significant at 1% level in regression specifications. Thus, our instrumental variable regression results also support our main hypothesis that there is a positive relation between idiosyncratic risk and CEO's incentives.

A.4. Change in Compensation Analysis

We investigate the robustness of the results above with respect to change in compensation, contrary to compensation level[33]. We estimate the following pooled regression:

$$\Delta LCOMP_{i,j,t} = \alpha_0 + \alpha_1 IDIO\_RISK_{j,t} + \alpha_2 SYS\_RISK_{j,t} + \alpha_3 ZSCORE\_DUM_{j,t} + \alpha_4 ROA_{j,t} + a_5 STOCK\_RET_{j,t} + \alpha_6 LASSETS_{j,t} + \alpha_7 GROWTH\_OPPORT_{j,t} + \alpha_8 CASH\_SHORT_{j,t} + \alpha_9 OPERT\_LOSS_{j,t} + \alpha_{10} TAX\_RATE_{j,t} + \alpha_{11} DIV\_CONST_{j,t} + \alpha_{12} ADV\_EXP/AT_{j,t} + \alpha_{13} ADV\_MISSING_{j,t} + \alpha_{14} RD\_EXP/AT_{j,t} + \alpha_{15} RD\_MISSING_{j,t} + \alpha_{16} INV\_EXP/AT_{j,t} + {}_{17} LEVERAGE_{j,t} + \alpha_{18} DIV\_YIELD_{j,t} + \alpha_{19} AGE_{j,t} + \alpha_{20} DUALITY_{j,t} + \alpha_{21} EXE\_DIR_{j,t} + \alpha_{22} GENDER_{j,t} + \alpha_{23} RATE\_DUM_{j,t} + \alpha_{24} INDUSTRY_j + \alpha_{25} YEAR_t + \varepsilon_{i,j,t} \quad (9)$$

Where, Δ*LCOMP* is the log of change in CEO's incentives measured as the log of change in cash, the log of change in equity, the log of change in total compensation and the log of change in pay-performance sensitivity. Taking first differences (Δ) and log transformation of PPS reduces our sample size. All the incentives measures are in logs. We provide the details definition of both dependent and independent variables in Appendix A.

<Insert Table IX here>

[33] Change-in-variables regressions are useful in mitigating problems with correlated omitted variables if such variables are time-invariant in the levels regressions. Weber (2006) suggests the use of change-in-variables regressions to address endogeneity concerns. Please see Weber (2006) for detailed discussion of the use of change-in-variable regression.

We hypothesize that idiosyncratic risk is positively associated with CEO's incentives. If our hypothesis is true, then the positive changes in CEO's incentives should be positively associated with idiosyncratic risk. Table XII presents estimated coefficients and standard errors for equation (9). When we use the log of the change in CEO's incentives as dependent variable, *IDIO_RISK* has positive and statistically significant coefficients on all specifications. The results again support our main hypothesis with a positive (0.37) and significant coefficient on *IDIO_RISK*. Overall, our test results using changes in CEO's cash, equity, cash compensation and pay-performance sensitivity as dependent variables confirm the earlier findings based on the level of compensation.

A.5. Robustness Analysis

In this subsection, we perform additional analysis to investigate the robustness of our empirical results.

A.5.1 Alternative Measure of Firm Size

The relation between the PPS and firm size is examined extensively by Jensen and Murphy (1990), Garen (1994), Baker and Hall (1998), Schaefer (1998), and Jin (2002). Following prior research we use log of sale and log of market value of equity in addition to log of total assets to examine the effects of idiosyncratic risk on CEO's incentives. We also include log of size square in our analysis. Our test results remain essentially unchanged. These tests again support our hypothesis that there is a positive relation between idiosyncratic risk and CEO's incentives.

A.5.2 Managerial Incentive, Investment Policy, and Idiosyncratic Risk

Managerial compensation may be influenced by the investment decision or incentives compensation may influence investment decisions[34]. It is also possible that investment decisions may influence idiosyncratic risk. Thus, following prior empirical work, we examine the relation among a firm's managerial incentive, financial policies, and investment policies. We use a system of equations to investigate the endogenous relation between firm's financial and investment policies and CEO incentives. We also compute firm policy factor using common

[34] See Guay (1999), Ryan and Wiggins (2002), Coles et al. (2006), Brockman, Martin, and Unlu (2010).

factor and include the firm policy factor in our model instead of individual firm policy variables. All these empirical tests do not change our original findings on idiosyncratic risk and incentive relation. Idiosyncratic risk continues to be positively related to CEO incentives.

A.5.3 Managerial Incentive, Corporate Governance, and Idiosyncratic Risk

There is an extensive body of research on the role of corporate governance on executive compensation. Prior empirical research finds evidence that compensation levels are higher when governance is weaker (Bebchuk and Fried, 2004). Several researchers also find evidence that CEO pay is higher when outside directors serve on multiple boards, when the board has interlocking directors, when more of the outside directors have been appointed under the current CEO, when there are no large outside block holders, when a smaller percentage of shares is held by institutional investors, and when anti-takeover protections are more significant (Borokhovich, Brunarski, and Parrino 1997; Hallock 1997; Core, Holthausen, and Larcker 1999; Cyert, Kang, and Kumar 2002; Hartzell and Starks 2003). Therefore, following prior research, we include governance measure[35] and examine the effects of idiosyncratic risk on CEO incentives. Our original results remain unchanged. These tests again support our hypothesis that there is a positive relation between idiosyncratic risk and CEO incentives.

A.5.4 Subsample study

Even though we control for the year effects in earlier tests while estimating the effects of *IDIO_RISK* on CEO incentives, our test results may be influenced by sample period. Therefore, we repeat our analysis using sub-sample data. When we estimate the effects of idiosyncratic risk on CEO incentives using the sample period of 1992 to 2000 and the sample period of 2001-2009 separately, our estimated coefficients for *IDIO_RISK* in both samples are positive and statistically significant indicating that *IDIO_RISK* has a positive effect on CEO incentives. Therefore, our test results are not influenced by sample period. The sub-sample test results support our original findings that idiosyncratic risk has the positive effect on CEO incentives.

V. Conclusion

[35] We use entrenchment index (EINDEX) as a measure of corporate governance. See Bebchuk, Cohen and Ferrell (2009) for detail explanation of entrenchment index.

CEO compensation and firm risk has been a focus of academic research for a long time. However, prior research findings are inconclusive. Prior research could be grouped as curve-linear, positive, negative or no relationship respectively between firm risk and CEO compensation. In this paper, we analyze the role of idiosyncratic risk on CEO incentives as measured by cash, equity, total compensation, and pay-performance sensitivity. Our main hypothesis is that idiosyncratic risk is positively related to CEO incentives.

To test our hypothesis, we construct a sample of 24,253 firm-year observations during the 18-year period from 1992 to 2009. We employ several econometric techniques to analyze the predicted relation between idiosyncratic risk and CEO incentives. We find a consistently positive and statistically significant relation between CEO incentives and idiosyncratic risk in our series of empirical tests. Our empirical findings are robust to controls for numerous factors that were found to have influence on CEO incentives in earlier studies. Contrary to the most recent finding, we document a positive relation between CEO incentives and idiosyncratic risk. Our results show that CEO pay increases with higher idiosyncratic risk. In other words, firms with higher idiosyncratic risk pay higher compensation to their CEOs.

Overall, this study extends the literature in determinants of CEO incentives. Our results add to the literature on the determinants of executive compensation by showing that idiosyncratic risk is a significant determinant, both statistically and economically. Perhaps most important, our empirical results highlight the role of idiosyncratic risk on executive compensation solving the dilemma on compensation and risk relationship.

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Appendix A

Variable Definitions and Data Sources

Variables	**Data Definition and Source**
LPPS	Logarithmic transformation of pay performance sensitivity. Change in the value of the CEO's stock and option portfolio due to a 1% increase in the value of the firm's common stock price. Data source: Computed using Standard and Poor's ExecuComp database.
LCASH_COMP	Logarithmic transformation of the dollar value of the sum of salary and bonuses earned by the named executive officer during the fiscal year. Data source: Standard and Poor's ExecuComp database.
L EQUITY_COMP	Logarithmic transformation of sum of Black Scholes value option awards, fair value of option awards, restricted stock grant and fair value of stock awards. Data source: Standard and Poor's ExecuComp database.
LTOTAL_COMP	Logarithmic transformation of sum of salary, bonus, non-equity incentive plan compensation, grant-date fair value of option awards, grant-date fair value of stock awards, deferred compensation earnings reported as compensation, and other compensation. Data source: Standard and Poor's ExecuComp database.
LΔCOMP	Logarithmic transformation of the change in salary, equity, total compensation, and pay-performance sensitivity. Data source: Standard and Poor's ExecuComp database.
IDIO_RISK	Annualized residual standard deviation estimated using EGARCH on Fama-French three factor model. 36-60 months monthly stock return immediately before the current fiscal year starting month is used in this estimation. Data source: CRSP monthly stock returns.
ZSCORE_DUM	Equals one if Altman's *Z*-score is greater than 1.81, and zero otherwise. Altman's *Z*-score is computed as sum of 3.3 ∗ OIADP/AT, 1.2 *(ACT-LCT)/AT, Sale/AT, 0.6*PRCC_F*CSHO/sum (of DLTT DLC), and 1.4*RE/AT. Data source: COMPUSTAT Annual Industrial file.
ROA	Ratio of operating income before depreciation to total assets. Data source: COMPUSTAT Annual Industrial file.
STOCK_RET	Buy-and-hold return during the fiscal year. Data source: CRSP monthly

	file.
LASSETS	Natural logarithm of total assets. Data source: COMPUSTAT Annual Industrial file.
GROWTH_OPPORT	Growth opportunity is market value of assets scaled by the book value of assets. Data source: COMPUSTAT Annual Industrial file.
CASH_SHORT	Cash flow shortfall is defined as sum of three year average of common and preferred dividends and cash flow from investing minus cash flow from operations scaled by total assets. Data source: COMPUSTAT Annual Industrial file.
OPERT_LOSS	Net operating loss equals to 1 if the firm has net operating loss carry forwards in any of the three years prior to when the new equity grant is awarded. Data source: COMPUSTAT Annual Industrial file.
TAX_RATE	Marginal tax rates is a dummy variable set equal to one when firms have nonzero tax loss carry-forwards and zero otherwise. Data source: COMPUSTAT Annual Industrial file.
DIV_CONST	Dividend constraint equal to 1 if the sum of retained earnings at year-end, cash dividend and stock repurchase during the year scaled by the prior year's cash dividends and stock repurchases is less than two
ADV_EXP/AT	Advertising expenditure (xad or zero if missing) scaled by assets. Data source: COMPUSTAT Annual Industrial file.
ADV_MISSING	A dummy variable equal to one if the Advertising expenditure is missing and zero otherwise. Data source: COMPUSTAT Annual Industrial file.
RD_EXP/AT	Research and development expenditures (xrd or zero if missing) scaled by assets. Data source: COMPUSTAT Annual Industrial file.
RD_MISSING	A dummy variable equal to one if the research and development expenditure is missing and zero otherwise. Data source: COMPUSTAT Annual Industrial file.
INVEST_EXP/AT	Investment expenditure is the sum of capital expenditures plus acquisitions over the last three years divided by market value of assets. Data source: COMPUSTAT Annual Industrial file.
LEVERAGE	Leverage is calculated as the difference between book value of assets

	and book value of equity scaled by market value of equity. Data source: COMPUSTAT Annual Industrial file.
DIV_YIELD	Dividend yield is dividend per share divided by close price of firm stock for the fiscal year. Data source: COMPUSTAT Annual Industrial file.
FP_FACTOR	FP_FACTOR Firm policy factor score is obtained using common factor analysis on the variables book-to-market ratio, R&D expenditures, and Investment expenditures. Data source: COMPUSTAT Annual Industrial file.
AGE	Executive's Age. Data source: Standard and Poor's ExecuComp database.
DUALITY	Duality equals one if the firm's executive holds more than one position during the fiscal year and zero otherwise. Data source: Standard and Poor's ExecuComp database.
EXE_DIR	Equals one if the firm's executive served as a director during the fiscal year and zero otherwise. Data source: Standard and Poor's ExecuComp database.
GENDER	Equals to one if an executive is female and zero otherwise. Data source: Standard and Poor's ExecuComp database.
TURNOVER	Executive turnover equals 1 if an executive during the fiscal year is different from the last fiscal year and zero otherwise. Data source: Standard and Poor's ExecuComp database.
EINDEX	EINDEX constructed by Bebchuk, Fried, and Walker (2009) used as a proxy for corporate governance. The highest value of EINDEX is 6. Data source: Professor Bebchuk's Website.
RATE_DUM	Equals to one if a firm has a bond rating during the fiscal year and zero otherwise. Data source: Standard and Poor's Credit Rating database.

Table I

Descriptive Statistics

This table presents the summary statistics of our dependent and explanatory variables used in this study over the sample period, 1992-2009. The detailed definitions of the variables are in the Appendix A.

VARIABLES	N	Mean	Stdev	Min	Q1	Median	Q3	Max
CASH_COMP	24253	1049.30	1187.99	0.001	467.19	757.70	1229.40	36812.51
EQUITY_COMP	24222	2098.50	8537.15	0.000	14.23	578.72	1966.63	650812.10
TOTAL_COMP	23039	3763.60	9390.11	0.001	904.70	1849.17	4046.09	655448.00
PPS	17526	59.580	60.924	0.846	9.659	32.687	100.514	168.622
IDIO_RISK	24253	0.339	0.173	0.082	0.225	0.304	0.411	4.256
SYS_RISK	24253	0.003	0.004	0.000	0.000	0.001	0.003	0.113
ZSCORE_DUM	24253	0.768	0.422	0.000	1.000	1.000	1.000	1.000
ROA	24253	0.116	0.074	0.000	0.067	0.101	0.149	0.930
STOCK_RETURN	24253	0.097	0.421	-0.711	-0.174	0.044	0.285	2.342
TOTAL_ASSETS	24253	5794	16357	23	496	1352	4231	355935
GROWTH_OPPORT	24253	2.053	1.614	0.453	1.222	1.589	2.299	78.56
CASH_SHORT	24253	-0.181	0.122	-0.941	-0.244	-0.169	-0.108	1.103
OPERT_LOSS	24253	0.070	0.255	0.000	0.000	0.000	0.000	1.000
TAX_RATE	24253	0.277	0.448	0.000	0.000	0.000	1.000	1.000
DIV_CONST	24253	0.684	0.465	0.000	0.000	1.000	1.000	1.000
ADV_EXP/AT	24253	0.014	0.039	0.000	0.000	0.000	0.008	0.819
ADV_MISSING	24253	0.677	0.468	0.000	0.000	1.000	1.000	1.000
RD_EXP/AT	24253	0.023	0.044	0.000	0.000	0.000	0.028	0.680
RD_MISSING	24253	0.437	0.496	0.000	0.000	0.000	1.000	1.000
INVEST_EXP/AT	24253	0.055	0.055	-0.121	0.021	0.039	0.068	0.672
LEVERAGE	24253	0.533	0.212	0.024	0.398	0.549	0.667	4.530
DIV_YIELD	24253	2.901	14.616	0.000	0.000	0.263	1.533	1294.40
AGE	24253	53.82	8.01	29.00	48.00	54.00	59.00	93.00
DUALITY	24253	0.907	0.290	0.000	1.000	1.000	1.000	1.000
EXE_DIR	24253	0.815	0.389	0.000	1.000	1.000	1.000	1.000
GENDER	24253	0.021	0.143	0.000	0.000	0.000	0.000	1.000
TURNOVER	24253	0.113	0.317	0.000	0.000	0.000	0.000	1.000
RATE_DUM	24253	0.520	0.500	0.000	0.000	1.000	1.000	1.000

Table II
Correlations between Variables

The table includes pairwise correlations of the main variables used in the regressions. The detailed definitions of the variables are in the Appendix A.

	VARIABLES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1	CASH_COMP	1.00																											
2	EQUITY_COMP	0.44	1.00																										
3	TOTAL_COMP	0.62	0.89	1.00																									
4	PPS	0.33	0.75	0.71	1.00																								
5	IDIO_RISK	-0.16	0.04	-0.05	0.01	1.00																							
6	SYS_RISK	-0.03	0.09	0.06	0.07	0.30	1.00																						
7	ZSCORE_DUM	0.05	0.03	0.03	0.03	-0.08	-0.04	1.00																					
8	ROA	0.08	0.10	0.11	0.13	-0.02	-0.08	0.09	1.00																				
9	STOCK_RETURN	0.04	-0.01	0.01	0.11	0.11	0.01	0.03	0.03	1.00																			
10	TOTAL_ASSETS	0.28	0.25	0.33	0.18	-0.19	-0.05	-0.06	-0.07	-0.03	1.00																		
11	GROWTH_OPPORT	0.02	0.22	0.18	0.24	0.13	0.00	-0.01	0.54	0.15	-0.05	1.00																	
12	CASH_SHORT	0.06	-0.09	-0.04	-0.12	-0.08	-0.03	-0.05	-0.30	0.04	0.05	-0.26	1.00																
13	OPERT_LOSS	-0.08	0.00	-0.05	0.00	0.22	0.08	-0.08	-0.05	0.09	-0.05	0.09	0.19	1.00															
14	TAX_RATE	0.03	0.12	0.10	0.16	0.09	0.08	0.05	-0.09	0.03	-0.04	-0.02	0.03	0.04	1.00														
15	DIV_CONST	-0.11	-0.03	-0.08	0.01	0.29	0.10	-0.01	-0.05	0.07	-0.13	0.02	-0.03	0.16	0.05	1.00													
16	ADV_EXP/AT	0.07	0.07	0.06	0.06	0.00	-0.04	0.06	0.19	-0.03	-0.01	0.09	-0.04	-0.01	-0.04	-0.06	1.00												
17	ADV_MISSING	-0.11	-0.15	-0.15	-0.17	-0.05	0.01	-0.04	-0.14	0.01	-0.10	-0.09	0.06	-0.01	-0.04	0.04	-0.52	1.00											
18	RD_EXP/AT	-0.06	0.15	0.09	0.14	0.21	0.07	-0.04	0.10	0.04	-0.05	0.31	-0.08	0.15	0.10	0.06	-0.04	-0.05	1.00										
19	RD_MISSING	0.00	-0.13	-0.10	-0.14	-0.14	-0.06	-0.12	-0.08	-0.01	-0.01	-0.16	0.05	-0.04	-0.11	-0.07	-0.04	0.14	-0.46	1.00									
20	INVEST_EXP/AT	-0.06	-0.10	-0.10	-0.11	-0.01	0.00	0.04	-0.19	-0.13	-0.04	-0.25	-0.17	-0.05	-0.01	0.08	-0.07	0.10	-0.15	0.13	1.00								
21	LEVERAGE	0.20	0.02	0.11	-0.06	-0.24	-0.04	-0.03	-0.20	-0.03	0.18	-0.25	0.26	-0.04	0.01	-0.11	-0.02	0.07	-0.29	0.21	0.09	1.00							
22	DIV_YIELD	0.19	0.16	0.21	0.11	-0.16	-0.06	0.00	0.02	0.00	0.71	-0.01	0.05	-0.05	-0.05	-0.17	0.03	-0.10	-0.02	-0.01	-0.05	0.11	1.00						
23	AGE	0.21	0.04	0.13	0.06	-0.14	-0.02	0.03	-0.05	-0.03	0.06	-0.09	0.06	-0.07	0.00	-0.06	-0.04	0.06	-0.06	-0.01	0.01	0.04	0.05	1.00					
24	DUALITY	0.05	-0.03	-0.01	-0.07	-0.06	-0.03	0.03	0.00	-0.02	0.00	-0.02	0.01	-0.03	-0.04	-0.03	-0.03	0.08	-0.03	0.01	0.04	0.04	-0.02	0.00	1.00				
25	EXE_DIR	0.20	0.16	0.20	0.16	0.04	0.02	0.01	0.00	0.00	-0.08	0.02	-0.02	0.00	-0.01	0.03	-0.01	0.00	0.04	-0.02	0.01	-0.06	-0.07	0.28	0.02	1.00			
26	GENDER	-0.01	0.01	0.01	0.01	0.05	-0.01	-0.03	0.00	-0.01	0.01	-0.01	0.01	0.01	0.03	-0.02	0.04	-0.06	-0.03	-0.01	-0.02	0.00	0.02	-0.08	-0.02	-0.06	1.00		
27	TURNOVER	-0.17	-0.04	-0.08	-0.02	0.01	-0.04	-0.02	-0.02	0.02	-0.03	-0.02	0.01	0.03	-0.02	0.02	0.02	-0.02	0.03	0.00	0.00	-0.01	-0.02	-0.09	-0.05	-0.07	0.01	1.00	
28	RATE_DUM	0.32	0.23	0.31	0.11	-0.31	-0.04	0.06	-0.13	-0.04	0.27	-0.16	0.16	-0.11	0.02	-0.15	0.02	0.01	-0.20	0.10	0.04	0.45	0.18	0.09	0.05	-0.06	-0.01	-0.04	1.00

Table III
Effects of Idiosyncratic Volatility on Incentives - OLS Regressions

This table presents the coefficients and standard errors obtained from the OLS estimation over the sample period, 1992-2009. CEO incentives are measured in four ways: the log of cash compensation, the log of equity compensation, the log of total compensation, and the log of pay-performance sensitivity. Standard errors are reported are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. The detailed definitions of all the variables are in the Appendix A[1].

	(1)	(2)	(3)	(4)
VARIABLES	LCASH_COMP	LEQUITY_COMP	LTOTAL_COMP	LPPS
INTERCEPT	2.93***	-0.28	2.03***	-1.98***
	(0.13)	(0.24)	(0.15)	(0.23)
IDIO_RISK	0.32***	0.95***	0.45***	0.41***
	(0.03)	(0.06)	(0.04)	(0.06)
SYS_RISK	-4.04***	8.83***	1.42	7.28***
	(1.18)	(2.31)	(1.55)	(2.07)
ZSCORE_DUM	0.05***	0.05*	0.12***	0.03
	(0.01)	(0.02)	(0.01)	(0.02)
ROA	1.79***	1.47***	1.57***	1.32***
	(0.08)	(0.15)	(0.10)	(0.14)
STOCK_RTN	0.14***	-0.07**	0.05***	0.33***
	(0.01)	(0.02)	(0.01)	(0.02)
LASSETS	0.29***	0.56***	0.43***	0.43***
	(0.00)	(0.01)	(0.01)	(0.01)
GROWTH_OPPORT	-0.02***	0.13***	0.05***	0.13***
	(0.00)	(0.01)	(0.00)	(0.01)
CASH_SHORT	0.31***	-0.29***	0.19***	-0.57***
	(0.05)	(0.08)	(0.06)	(0.08)
OPERT_LOSS	-0.07***	0.13***	-0.06*	0.13***
	(0.02)	(0.04)	(0.02)	(0.03)
TAX_RATE	0.02	0.04	0.03*	0.04*
	(0.01)	(0.02)	(0.01)	(0.02)
DIV_CONST	-0.02*	0.08***	0.02	0.10***
	(0.01)	(0.02)	(0.01)	(0.02)
ADV_EXP/AT	0.37*	1.15***	0.61***	0.73**
	(0.15)	(0.29)	(0.18)	(0.24)
ADV_MISSING	-0.03*	0.00	0.00	0.00
	(0.01)	(0.02)	(0.02)	(0.02)
RD_EXP/AT	0.29*	2.50***	1.80***	1.37***
	(0.15)	(0.26)	(0.17)	(0.23)
Year Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Observations	24253	18282	24253	17526
Adjusted R^2	34.39%	45.50%	45.67%	50.19%

[1] Due to the space constraints we omit RD_MISSING, INVEST_EXP/AT, LEVERAGE, DIV_YIELD, AGE, DUALITY, EXE_DIR, GENDER, TURNOVER and RATE_DUM variables from this table.

Table IV
Effects of Idiosyncratic Volatility on Incentives - Median Regression

This table presents the coefficients and standard errors obtained from the median estimation over the sample period, 1992-2009. CEO incentives are measured in four ways: the log of cash compensation, the log of equity compensation, the log of total compensation, and the log of pay-performance sensitivity. Standard errors are reported are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. The detailed definitions of all the variables are in the Appendix A[2].

	(1)	(2)	(3)	(4)
VARIABLES	LCASH_COMP	LEQUITY_COMP	LTOTAL_COMP	LPPS
INTERCEPT	2.77***	-0.52*	1.78***	-2.04***
	(0.10)	(0.24)	(0.14)	(0.27)
IDIO_RISK	0.53***	1.34***	0.56***	0.21**
	(0.03)	(0.07)	(0.04)	(0.07)
SYS_RISK	-3.97***	1.32	1.56	3.53
	(0.97)	(2.36)	(1.42)	(2.40)
ZSCORE_DUM	0.04***	0.05*	0.09***	0.04
	(0.01)	(0.02)	(0.01)	(0.02)
ROA	1.85***	1.07***	1.51***	0.90***
	(0.07)	(0.16)	(0.09)	(0.16)
STOCK_RTN	0.14***	-0.09***	0.05***	0.31***
	(0.01)	(0.02)	(0.01)	(0.02)
LASSETS	0.31***	0.57***	0.45***	0.44***
	(0.00)	(0.01)	(0.01)	(0.01)
GROWTH_OPPORT	-0.01***	0.16***	0.07***	0.19***
	(0.00)	(0.01)	(0.00)	(0.01)
CASH_SHORT	0.29***	-0.18*	0.26***	-0.40***
	(0.04)	(0.09)	(0.05)	(0.09)
OPERT_LOSS	-0.00	0.10**	-0.01	0.08*
	(0.02)	(0.04)	(0.02)	(0.04)
TAX_RATE	-0.01	0.03	-0.00	0.04
	(0.01)	(0.02)	(0.01)	(0.02)
DIV_CONST	-0.01	0.03	0.00	0.11***
	(0.01)	(0.02)	(0.01)	(0.02)
ADV_EXP/AT	0.59***	0.63*	0.71***	0.45
	(0.13)	(0.29)	(0.16)	(0.28)
ADV_MISSING	0.00	-0.01	-0.00	-0.02
	(0.01)	(0.02)	(0.01)	(0.02)
RD_EXP/AT	0.05	2.10***	1.74***	1.15***
	(0.12)	(0.26)	(0.16)	(0.27)
Year Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Observations	24253	18282	24253	17526
Pseudo R^2	29.84%	31.79%	33.71%	35.89%

[2] Due to the space constraints we omit RD_MISSING, INVEST_EXP/AT, LEVERAGE, DIV_YIELD, AGE, DUALITY, EXE_DIR, GENDER, TURNOVER and RATE_DUM variables from this table.

Table V

Effects of Idiosyncratic Volatility on Incentives - Robust Regression

This table presents the coefficients and standard errors obtained from the robust estimation over the sample period, 1992-2009. CEO incentives are measured in four ways: the log of cash compensation, the log of equity compensation, the log of total compensation, and the log of pay-performance sensitivity. Standard errors are reported are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. The detailed definitions of all the variables are in the Appendix A[3].

	(1)	(2)	(3)	(4)
VARIABLES	LCASH_COMP	LEQUITY_COMP	LTOTAL_COMP	LPPS
INTERCEPT	3.12***	-0.29	1.90***	-2.00***
	(0.08)	(0.21)	(0.13)	(0.22)
IDIO_RISK	0.07**	1.51***	0.51***	0.36***
	(0.02)	(0.06)	(0.04)	(0.05)
SYS_RISK	-1.14	1.51	2.99*	5.24**
	(0.85)	(2.03)	(1.32)	(1.99)
ZSCORE_DUM	0.03***	0.07***	0.08***	0.03
	(0.01)	(0.02)	(0.01)	(0.02)
ROA	1.75***	0.93***	1.43***	0.87***
	(0.05)	(0.13)	(0.08)	(0.13)
STOCK_RTN	0.14***	-0.11***	0.06***	0.31***
	(0.01)	(0.02)	(0.01)	(0.02)
LASSETS	0.29***	0.57***	0.45***	0.45***
	(0.00)	(0.01)	(0.00)	(0.01)
GROWTH_OPPORT	-0.01***	0.17***	0.08***	0.20***
	(0.00)	(0.01)	(0.00)	(0.01)
CASH_SHORT	0.34***	-0.16*	0.21***	-0.41***
	(0.03)	(0.07)	(0.05)	(0.07)
OPERT_LOSS	0.00	0.06	-0.01	0.09**
	(0.01)	(0.03)	(0.02)	(0.03)
TAX_RATE	-0.01	0.03	0.01	0.04*
	(0.01)	(0.02)	(0.01)	(0.02)
DIV_CONST	0.02*	0.05**	0.02	0.10***
	(0.01)	(0.02)	(0.01)	(0.02)
ADV_EXP/AT	0.68***	1.10***	0.74***	0.68**
	(0.10)	(0.25)	(0.15)	(0.23)
ADV_MISSING	-0.00	0.02	-0.02	-0.01
	(0.01)	(0.02)	(0.01)	(0.02)
RD_EXP/AT	0.42***	1.97***	1.79***	0.99***
	(0.10)	(0.23)	(0.15)	(0.22)
Year Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Observations	24253	18282	24253	17526
Adjusted R^2	57.94%	52.89%	55.33%	54.48%

[3] Due to the space constraints we omit RD_MISSING, INVEST_EXP/AT, LEVERAGE, DIV_YIELD, AGE, DUALITY, EXE_DIR, GENDER, TURNOVER and RATE_DUM variables from this table.

Table VI

Effects of Rank Idiosyncratic Volatility on Incentives – Rank Risk

This table presents the coefficients and standard errors obtained from the OLS estimation over the sample period, 1992-2009. Idiosyncratic risk is measured as rank risk. CEO incentives are measured in four ways: the log of cash compensation, the log of equity compensation, the log of total compensation, and the log of pay-performance sensitivity. Standard errors are reported are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. The detailed definitions of all the variables are in the Appendix A[4].

	(1)	(2)	(3)	(4)
VARIABLES	LCASH_COMP	LEQUITY_COMP	LTOTAL_COMP	LPPS
INTERCEPT	3.08***	-0.67**	1.95***	-2.33***
	(0.08)	(0.24)	(0.15)	(0.23)
RANK IDIO RISK	0.00***	0.01***	0.00***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
RANK SYST RISK	0.00	0.00**	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
ZSCORE_DUM	0.03***	0.09***	0.12***	0.05*
	(0.01)	(0.02)	(0.01)	(0.02)
ROA	1.78***	1.68***	1.62***	1.50***
	(0.05)	(0.15)	(0.10)	(0.14)
STOCK_RTN	0.14***	-0.09***	0.04**	0.31***
	(0.01)	(0.02)	(0.01)	(0.02)
LASSETS	0.29***	0.60***	0.44***	0.46***
	(0.00)	(0.01)	(0.01)	(0.01)
GROWTH_OPPORT	-0.01***	0.13***	0.05***	0.13***
	(0.00)	(0.01)	(0.00)	(0.01)
CASH_SHORT	0.36***	-0.17*	0.23***	-0.49***
	(0.03)	(0.08)	(0.06)	(0.08)
OPERT_LOSS	-0.00	0.13***	-0.05*	0.12***
	(0.01)	(0.04)	(0.02)	(0.03)
TAX_RATE	-0.01	0.03	0.02	0.03
	(0.01)	(0.02)	(0.01)	(0.02)
DIV_CONST	0.01	0.02	-0.00	0.05**
	(0.01)	(0.02)	(0.01)	(0.02)
ADV_EXP/AT	0.67***	1.09***	0.60***	0.66**
	(0.10)	(0.28)	(0.18)	(0.24)
ADV_MISSING	-0.00	0.02	0.00	0.01
	(0.01)	(0.02)	(0.02)	(0.02)
RD_EXP/AT	0.37***	2.17***	1.71***	1.13***
	(0.10)	(0.26)	(0.17)	(0.23)
Year Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Observations	24253	18282	24253	17526

[4] Due to the space constraints we omit RD_MISSING, INVEST_EXP/AT, LEVERAGE, DIV_YIELD, AGE, DUALITY, EXE_DIR, GENDER, TURNOVER and RATE_DUM variables from this table.

Adjusted R^2	57.98%	46.39%	45.81%	50.76%

Table VII
Effects of Idiosyncratic Volatility on Incentives – GMM

This table presents the coefficients and standard errors obtained from the GMM estimation over the sample period, 1992-2009. CEO incentives are measured in four ways: the log of cash compensation, the log of equity compensation, the log of total compensation, and the log of pay-performance sensitivity. Standard errors are reported are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. The detailed definitions of all the variables are in the Appendix A[5].

	(1)	(2)	(3)	(4)
VARIABLES	LCASH_COMP	LEQUITY_COMP	LTOTAL_COMP	LPPS
INTERCEPT	-9.10***	-36.18***	-23.90***	-24.19***
	(0.17)	(0.24)	(0.06)	(0.31)
IDIO RISK HAT1	20.19***	59.29***	42.74***	36.43***
	(0.21)	(0.32)	(0.07)	(0.39)
SYS_RISK	-200.42***	-568.56***	-413.89***	-349.15***
	(2.30)	(3.41)	(0.79)	(4.19)
ZSCORE_DUM	0.55***	1.62***	1.17***	0.99***
	(0.01)	(0.02)	(0.00)	(0.02)
ROA	6.98***	16.08***	12.21***	10.42***
	(0.09)	(0.12)	(0.03)	(0.15)
STOCK_RTN	-0.35***	-1.47***	-1.00***	-0.54***
	(0.01)	(0.01)	(0.00)	(0.02)
LASSETS	0.97***	2.57***	1.90***	1.66***
	(0.01)	(0.01)	(0.00)	(0.01)
GROWTH_OPPORT	-0.16***	-0.30***	-0.23***	-0.13***
	(0.00)	(0.00)	(0.00)	(0.01)
CASH_SHORT	2.09***	4.91***	3.83***	2.61***
	(0.04)	(0.06)	(0.02)	(0.07)
OPERT_LOSS	-1.31***	-3.60***	-2.67***	-2.17***
	(0.02)	(0.03)	(0.01)	(0.04)
TAX_RATE	-0.39***	-1.11***	-0.81***	-0.68***
	(0.01)	(0.01)	(0.00)	(0.02)
DIV_CONST	-1.17***	-3.36***	-2.44***	-2.02***
	(0.02)	(0.02)	(0.01)	(0.03)
ADV_EXP/AT	-0.29*	-1.58***	-1.10***	-0.71***
	(0.13)	(0.17)	(0.04)	(0.20)
ADV_MISSING	0.35***	1.07***	0.75***	0.65***
	(0.01)	(0.02)	(0.00)	(0.02)
RD_EXP/AT	-4.96***	-12.75***	-9.63***	-8.13***
	(0.14)	(0.17)	(0.05)	(0.21)
Year Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes

[5] Due to the space constraints we omit RD_MISSING, INVEST_EXP/AT, LEVERAGE, DIV_YIELD, AGE, DUALITY, EXE_DIR, GENDER, TURNOVER and RATE_DUM variables from this table.

Observations	23039	18007	23039	17455
Adjusted R^2	54.75%	81.35%	96.69%	66.69%

Table VIII

Effects of Idiosyncratic Volatility on Incentives – Instrumental Variable

The table presents the coefficients and standard errors obtained from two-stage instrumental variable estimations of CEO compensation over the sample period, 1992-2009. CEO incentives are measured in four ways: the log of cash compensation, the log of equity compensation, the log of total compensation, and the log of pay-performance sensitivity. Standard errors are reported are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. The detailed definitions of all the variables are in the Appendix A[6].

	(1)	(2)	(3)	(4)
VARIABLES	LCASH_COMP	LEQUITY_COMP	LTOTAL_COMP	LPPS
INTERCEPT	1.94***	-1.14***	1.69***	-2.64***
	(0.38)	(0.28)	(0.17)	(0.26)
IDIO_RISK	2.55***	2.53***	1.10***	1.63***
	(0.68)	(0.25)	(0.16)	(0.22)
SYS_RISK	-22.12***	-3.20	-3.73	-2.06
	(5.52)	(3.00)	(1.99)	(2.64)
ZSCORE_DUM	0.11***	0.10***	0.13***	0.06**
	(0.02)	(0.02)	(0.01)	(0.02)
ROA	2.38***	1.87***	1.70***	1.63***
	(0.17)	(0.17)	(0.11)	(0.15)
STOCK_RTN	0.10***	-0.10***	0.03*	0.30***
	(0.02)	(0.02)	(0.01)	(0.02)
LASSETS	0.37***	0.62***	0.46***	0.47***
	(0.03)	(0.01)	(0.01)	(0.01)
GROWTH_OPPORT	-0.03***	0.12***	0.04***	0.13***
	(0.01)	(0.01)	(0.00)	(0.01)
CASH_SHORT	0.43***	-0.27**	0.20***	-0.55***
	(0.05)	(0.09)	(0.06)	(0.08)
OPERT_LOSS	-0.20***	0.06	-0.09***	0.07
	(0.04)	(0.04)	(0.03)	(0.04)
TAX_RATE	-0.02	0.02	0.02	0.03
	(0.01)	(0.02)	(0.01)	(0.02)
DIV_CONST	-0.13***	-0.01	-0.02	0.04
	(0.04)	(0.02)	(0.02)	(0.02)
ADV_EXP/AT	0.23	1.06***	0.54**	0.60*
	(0.18)	(0.29)	(0.18)	(0.24)
ADV_MISSING	-0.00	0.01	0.00	0.01
	(0.01)	(0.02)	(0.02)	(0.02)
RD_EXP/AT	-0.25	2.05***	1.61***	1.02***
	(0.26)	(0.27)	(0.18)	(0.24)
Year Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Observations	24253	18282	24253	17526
Adjusted R^2	24.46%	43.66%	45.17%	48.87%

[6] Due to the space constraints we omit RD_MISSING, INVEST_EXP/AT, LEVERAGE, DIV_YIELD, AGE, DUALITY, EXE_DIR, GENDER, TURNOVER and RATE_DUM variables from this table.

Table IX

Effects of Idiosyncratic Volatility on Incentives – Change in Compensation

This table presents the coefficients and standard errors obtained from the OLS estimation over the sample period, 1992-2009. CEO incentives are measured in four ways: the log of change in cash compensation, the log of change in equity compensation, the log of change in total compensation, and the log of change in pay-performance sensitivity. Standard errors are reported are in parentheses. ***, **, and * denote significance at the 1%, 5% and 10% levels, respectively. The detailed definitions of all the variables are in the Appendix A[7].

	(1)	(2)	(3)	(4)
VARIABLES	LΔCASH_COMP	LΔEQUITY_COMP	LΔTOTAL_COMP	LΔPPS
INTERCEPT	1.32***	1.35**	1.94***	0.74
	(0.29)	(0.42)	(0.36)	(0.66)
IDIO_RISK	1.20***	1.73***	1.15***	0.33*
	(0.08)	(0.12)	(0.10)	(0.14)
SYS_RISK	-17.61***	11.40**	13.08***	-0.43
	(2.87)	(3.88)	(3.61)	(6.16)
ZSCORE_DUM	0.07*	-0.00	0.11***	-0.10
	(0.03)	(0.04)	(0.03)	(0.05)
ROA	1.49***	1.29***	1.04***	0.52
	(0.19)	(0.25)	(0.22)	(0.36)
STOCK_RTN	0.40***	0.01	0.16***	0.82***
	(0.03)	(0.04)	(0.03)	(0.05)
LASSETS	0.37***	0.53***	0.52***	0.12***
	(0.01)	(0.01)	(0.01)	(0.02)
GROWTH_OPPORT	-0.01	0.10***	0.08***	0.02
	(0.01)	(0.01)	(0.01)	(0.02)
CASH_SHORT	0.74***	-0.39**	0.25	-0.18
	(0.11)	(0.15)	(0.13)	(0.20)
OPERT_LOSS	-0.05	0.17**	0.08	0.32**
	(0.05)	(0.06)	(0.05)	(0.12)
TAX_RATE	-0.07**	0.05	0.06*	-0.09*
	(0.03)	(0.03)	(0.03)	(0.04)
DIV_CONST	-0.02	0.10**	0.04	-0.02
	(0.03)	(0.03)	(0.03)	(0.04)
ADV_EXP/AT	0.88*	1.33**	1.05*	0.86
	(0.37)	(0.48)	(0.43)	(0.64)
ADV_MISSING	-0.01	0.06	-0.04	0.02
	(0.03)	(0.04)	(0.04)	(0.05)
RD_EXP/AT	1.08**	2.14***	1.89***	0.09
	(0.35)	(0.45)	(0.41)	(0.60)
Year Effects	Yes	Yes	Yes	Yes
Industry Effects	Yes	Yes	Yes	Yes
Observations	13897	10845	12520	8301
Adjusted R^2	17.20%	28.56%	27.91%	19.05%

[7] Due to the space constraints we omit RD_MISSING, INVEST_EXP/AT, LEVERAGE, DIV_YIELD, AGE, DUALITY, EXE_DIR, GENDER, TURNOVER and RATE_DUM variables from this table.