

PERFORMANCE PAY SENSITIVITY: DO TOP MANAGEMENT INCENTIVES ALIGN WITH SHAREHOLDER VALUE CREATION?

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Abstract

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Arising from the principal-agent consideration, Jensen and Murphy (1990b) studied the pay-performance sensitivity (including pay, options, stockholdings, and dismissal) for chief executive officers (CEOs) in the 1980s. They found that CEO wealth changes \$3.25 for every \$1,000 change in shareholder wealth. In this study, we revisit the issue of the linkage between CEO pay and performance but with the difference that we only include observable measures in the pay-performance sensitivity estimate. Our data on executive compensation stems from the ExecuComp database on S&P 1500 firms, and the performance data from the Center for Research in Security Prices (CRSP) database (total: 23,737 firm-year observations). We find that CEO wealth changes \$5.34 for every \$1,000 change in shareholder wealth. Almost all of this sensitivity is attributed to compensation through stock options and the CEO's inside stockholdings. Today, the incentives generated by stock options have increased thirteen times, and the total pay-performance sensitivity has almost doubled in value, compared to when Jensen and Murphy (1990b) estimated the pay-performance sensitivity in the 1980s for the first time. Despite the increased pay-performance sensitivity, we hypothesize that internal and external political forces negatively affect the CEO's performance incentives. Compensation constraints reduce the pay-performance sensitivity and hereby the incentives for the CEO to maximize shareholder wealth. Further research on how CEO wealth varies with absolute and relative corporate performance is required to determine if the CEO's incentives are consistent with shareholder wealth maximization.

Keywords: Compensation, Incentives, Pay-Performance Sensitivity, Shareholder Value, Top Executive, Stock Options

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1. INTRODUCTION

Chief executive officer (CEO) compensation has always received a great deal of attention in the media and academic literature. Articles like “The Great CEO Pay Heist” by Colvin (2001) in *Fortune Magazine* contribute to the heated discussion. The average CEO in the S&P 1500 Index received more than 24 million dollars in compensation in 2013. Compensation practitioners, academics, and shareholders constantly evaluate how appropriate such an amount of money is to align CEO behaviour with shareholder value maximization (Burkert & Lueg, 2013; Schmaltz, Lueg, Agerholm, & Wittrup, 2020). Since Jensen and Meckling (1976), Fama (1980), the issue of managerial power, asymmetric information, and the different interests between CEO and shareholders have been analyzed in academic literature as an *agency problem*. A rational principal should take the agency problem into account when designing the compensation structures, considering the monetary incentives for the CEO to become the shareholder value-maximizing agent whom the principal seeks. Academics such as Garen (1994), Hall and Liebman (1998), Bebchuk and Fried (2004) also concern the agency problem in the CEO-shareholder context, where the emphasis is primarily on the financial relationship between the two parties. Understanding the financial relation between CEO and shareholder wealth sheds light on how to design a compensation contract, and the extent of the agency problem, and enables an assessment of whether the monetary incentives are large enough to alleviate the agency costs. To align the different interests of the principal and the agent, performance contracts have gained popularity. The objective of performance contracts is to tie CEO wealth to shareholder wealth. The premise underlying performance pay contracts is that, if the CEO has sufficient monetary incentives, they will prefer the same investment choices, capital structure, etc., as the shareholders.

A seminal study in the executive compensation literature is Jensen and Murphy (1990b). They find CEO pay-performance sensitivity to be \$3.25 among 2,213 CEOs in 1,295 American firms during the period 1974–1986. Directly and indirectly, the CEO receives \$3.25 per \$1,000 increase in shareholder wealth. Jensen and Murphy argue that CEOs are paid like bureaucrats and a move towards more performance-based compensation contracts is needed to align the interest of the CEO and shareholders. Specifically, Jensen and Murphy (1990a, 1990b) strongly advocate increasing and enforcing the CEO’s inside stock ownership and stock-based compensation. Inside stock holdings and options prove to be the main drivers of the pay-performance sensitivity as these components are most directly linked to shareholder wealth. Just as Jensen and Murphy recommended, an increase in stock option issuance occurred during the 1980s and 1990s. Even though stock-based compensation has its flaws (Carpenter, 2002; Hall & Murphy, 2003), there seems to be a consensus in the academic literature that stock-based compensation has substantial impact on CEO behavior. Because of the boom in stock options as well as new financial accounting legislation that has increased

transparency in executive compensation, a re-estimation of the pay-performance sensitivity is relevant once again. Thus, we pose the research question:

RQ1: Do top management incentives align with shareholder value creation?

To address this question, we use panel data analyses on firms in the S&P 1500 Index between 1994 and 2013 (23,737 firm-year observations). Taking a principal-agent perspective, we find that the pay-performance sensitivity has substantially increased and is now significantly positively interlinked and dependent on CEO stock ownership. Pay-performance sensitivity related to stock options has even increased thirteen times, and constitutes one of the most interesting findings of this study.

We organize the remainder of the paper as follows: Section 2 provides a literature review; Section 3 argues for our chosen methodology; Section 4 presents the results, which are discussed in Section 5; Section 6 concludes.

2. LITERATURE REVIEW: PRINCIPAL-AGENT THEORY, AGENCY CONFLICTS, AND THE ROLE OF COMPENSATION

The principal-agent problem occurs when one person or entity (agent) can make decisions on behalf of, or that impact, another person or entity (principal). The dilemma exists because sometimes the agent is motivated to act in their own best interests rather than those of the principal. The agency problem arises when the two parties have different interests and asymmetric information (the agent having more information), such that the principal cannot directly ensure that the agent is always acting in the principal’s best interests (Borisov & Lueg, 2016). In particular, the principal-agent problem arises when activities that are valuable to the principal are costly to the agent, and where actions of the agent are costly for the principal to observe (Nicholson & Snyder, 2011). The theoretical cost of an agent undertaking non-optimal decisions on behalf of the principal is in economics referred to as agency costs. One example of this is could be when the CEO undertakes a pet project. Agency costs represent the difference between the value of an actual firm and the value of a hypothetical firm that would exist in a perfect world where management and shareholder incentives align (Hillier, Grinblatt, & Titman, 2012). Various mechanisms may be used to align the interests of the agent with those of the principal. In a CEO-shareholder context, the principal may utilize profit sharing, efficiency wages, performance-pay, or the threat of termination of employment as tools to reduce agency costs by disciplining and providing the CEO with incentives to take shareholder value-maximizing choices.

The CEO is the highest-ranking executive in a firm, whose main responsibilities include developing and implementing high-level strategies, making major corporate decisions, managing the overall operations and resources of a firm, and acting as the main point of communication between the board of directors and the corporate operations. They are thus a key element in creating shareholder wealth. What shareholders need to bear in mind is that the share price is affected by many factors, in

addition to the CEO's managerial abilities, e.g., actions of other executives and employees, demand and supply conditions, public policy, and business cycles, etc. Roughly speaking there are two types of shareholders: short-term and long-term investors. Short-term investors prefer that the CEO maximizes share price within a foreseeable future, as they do not plan on maintaining their current position is contrary to the long-term investors. To mitigate the problem that a CEO might act shortsightedly in their investment choices (as an attempt to secure their job position, compensation bonus, etc.), CEO compensation structures usually include various long-term monetary incentives. The long-term incentives can be, e.g., restricted stock, options, pension, and non-equity incentive plan. All these instruments have attempt to steer the manager away from the short-sighted investment which is characterized by the manager passing up high-net-present-value (NPV) projects in favor of lower-NPV projects that pay off sooner (Hillier et al., 2012). Free cash flows are an example of how the principal and the agent make different choices. As a rule of thumb, investors prefer free cash flows distributed as dividends or used in a share repurchase program unless there is an internal investment where the return exceeds the investors' opportunity cost of capital. Some firms generate large amounts of free cash flows, which grants the CEO discretion in allocating these resources. To discipline the CEO, the principal has a variety of different options. One of the most efficient ways is to alter the capital structure of the firm, increasing the leverage ratio, and thereby reducing the amount of free capital at the CEO's disposal (Jensen, 1986). An increase in the debt ratio is a strong signal to the outside world as it proves that the firm is financially healthy and capable of meeting future debt payments. A CEO may promise to increase dividends in the future or repurchase the firm's equity to increase share prices, but this is not a credible statement, whereas increased debt forces the CEO to meet the debt obligations. Also, should bankruptcy incur, management equity holdings would have little or no value. Empirical studies have found that leverage-increasing decisions do exhibit a positive impact on shareholder value (Jensen, 1986).

In this study, we assume that the CEO is an agent who seeks to maximize their wealth and gives no thought to any social, altruistic, or Pareto considerations in the economy as a whole. The CEO is a risk-averse agent as they have a relatively large amount of equity and options, compared to the typical shareholder, exposing them to firm-specific risk. Besides the monetary risks, the CEO also has a job and reputation strongly tied to the firm's performance. The stockholders (principals) are assumed to be well-diversified investors holding a market portfolio, which means their risk exposure is limited to the systematic market risk (Garen, 1994). A CEO might forsake a risky but positive NPV investment, while shareholders want the CEO to take risks as long the return on investment is positive. This accentuates why compensation contracts are tricky, and academics and practitioners such as compensation consultants have been working on this for decades.

If the CEO holds a lot of firm equity it limits their diversification possibilities. The executive will

then try to direct the firm's investments to safer projects, with lower (but less risky) return and hereby reduce the return on equity for all shareholders. Standard stock-based compensation will follow investment payoffs linearly, meaning that the risk-averse CEO must be compensated convexly in market capitalization to counteract their risk-aversion. Holmstrom and Milgrom (1987), and Rosen (1990) propose a utility function for the risk-averse CEO. They consider a standard principal-agent model with CEO work effort given by μ and firm revenue as $R = \mu + E$, where E is a random disturbance with zero mean and variance σ^2 . CEO income is $Y = b_0 + b_1 R$ and the CEO's utility function is:

$$U = \frac{-\exp[-p(Y - 0.5k\mu^2)]}{p} \quad (1)$$

where, p is the measure of absolute risk aversion, $0.5k\mu^2$ is the cost of effort, and Y still being the CEO's income.

As p is positive, the CEO's utility function is concave in risk aversion, which can be proven by differentiating equation (1) with regard to p . From the utility function, it follows that a convex compensation function is required if the CEO is to prefer the same investment choices as a diversified (risk-neutral) shareholder. This is a predicament because at the same time the CEO holds more equity, which is regarded as the best solution to the principal-agent problem, they will also become more risk-averse. It seems natural to presume that managerial risk aversion is affected by the CEO's age and wealth among other factors, indicating that a uniform compensation package is not likely to be optimal.

The already discussed study of Jensen and Murphy (1990b) is one of the most cited studies in this field. It estimates the pay-performance sensitivity by following all of the 2,213 CEOs listed in the Executive Compensation Surveys published in *Forbes* from 1974 to 1986. Their survey included executives serving in 1,295 firms. Several recent articles have followed up on the pay-performance sensitivity and added new insights (for a comprehensive literature review, see Edmans, Gabaix, and Jenter, 2017). Clifford and Lindsey (2016) investigate the importance of active and passive roles for major blockholders. They find that the equity portion of executive pay is higher in actively monitored firms. Agrawal and Nasser (2019) find that the pay-performance sensitivity improves with the independent of the board. Such firms espouse lower excess CEO pay (incl. lower flow and stock of CEO equity incentives), and higher valuations. Kimbro and Xu (2016) compare firms that are partial to say-on-pay votes of their shareholders against those who are not. Firms approving say-on-pay tend to have better performance, lower CEO compensation, and higher CEO ownership (as well as lower institutional ownership). Rejection on say-on-pay is quite sensitive to the degree of stock-based compensation. Similarly, Ntim, Lindop, Thomas, Abdou, and Opong (2019) confirm a small positive relation between pay-performance sensitivity and firm performance. This relationship increase under the moderating effect of CEO power (i.e., the CEO is reputable, was

a founder, has long tenure, and high equity stakes) and corporate governance structure (i.e., high equity shares of directors, ownership concentration, and small, independent boards and compensation committees). Wu, Li, Ying, and Chen (2018) show that strong political connections boost CEO pay and firm performance in general in a Chinese setting. However, this relationship weakens in developed regions of the country where more competition exists. Gupta and Wowak (2016) take the board perspective in the U.S. and show that CEO pay-performance sensitivity is higher if the board of directors — and especially those that are on the compensation committee — are politically conservative. Maas (2018) investigates an extension of shareholder value targets to corporate social performance (CSP). She finds that higher CSP targets only translate into better CSP performance if they are formalized and quantitatively implemented in compensation.

3. METHODOLOGY

The goal of this study is to stay as true as possible to Jensen and Murphy (1990b) estimation procedures, which implies that the same compensation variables will be used to calculate the pay-performance sensitivity in the newer period 1994-2013. The first-difference (FD) estimator will be applied to estimate the change in CEO wealth (in thousands of dollars) associated with a \$1,000 increase in shareholder wealth.

3.1. Data

Data on CEO compensation is extracted from the ExecuComp database, where data collection on the S&P 1500 Index began in 1994. As ExecuComp is based on fiscal years, not all firms have reported results for 2014 yet. This study covers firms currently in the S&P 1500 Index, firms that were once part of the S&P 1500 as well as firms removed from the index that is still actively traded. The 20-year window contains 23,737 firm-year observations and contains information about most of the compensation variables. The S&P 1500 is the dataset of choice as it covers approximately 90% of the total U.S. market capitalization. Given that the goal of this study is to estimate the pay-performance sensitivity for CEOs in publicly traded firms, the S&P 1500 is an appropriate proxy. The firm's market value and shareholder yearly return with dividends reinvested are collected from the Center for Research in Security Prices (CRSP) and is merged with the ExecuComp database and analyzed with Stata software.

A relatively small amount of the variables in the data set had entry errors (< 0.01%), where the issue was duplicate years, wrong units (millions vs. thousands), negative fair value of value option grants, and percentage values exceeding 100 percent. All of these errors have either been corrected using third party information such as Yahoo Finance or been deleted. Some of the observations had missing data and if it was one of the key variables to the analysis such as shareholder return, market value, or CEO inside shareholdings the observation was dropped. It appears that the missing data is random and

therefore should not provide biased estimates if excluded. To obtain a proper estimate of the increase in shareholder wealth we calculated the inflation-adjusted shareholder return with dividends reinvested in equation (2). Collecting U.S. inflation data for the past twenty years from the OECD (2015) database and yearly return with dividends reinvested from CRSP, the inflation-adjusted shareholder return with dividends reinvested is calculated:

$$r_{it} = \frac{1 + (\text{Return with dividends reinvested})_{it}}{(1 + \text{inflation}_{it})} - 1 \quad (2)$$

Equation (2) expresses the real shareholder return as it accounts for the return period's inflation rate and the wealth increase associated with dividend payouts. A small bias with the inflation-adjusted return persists, as the OECD inflation rate follows a calendar year and the firm return is measured in fiscal years. However, seeing as inflation is fairly persistent and small.

3.2. Estimation procedure

In line with Jensen and Murphy (1990b), we assume that CEO compensation is a function of firm performance. Like them, we use a market-based measure for performance (market value) instead of an accounting-based one such as profits since shareholders are most interested in the alignment of executive compensation with the return from their own shares. A panel data regression model explaining the relation between CEO compensation and market value is:

$$Y_{it} = \beta_0 + \beta_1 MV_{it} + c_i + \varepsilon_{it} \quad (3)$$

where Y_{it} reflects the various elements of CEO compensation, MV_{it} is the market value of the firm, ε_{it} is the error term of the regression model, and c_i is unobserved the idiosyncratic error. Examples of unobservable characteristics might include information uniquely attached to that specific observation such as the CEO's risk aversion or unobserved attributes of the firm's production technology. Taking the first difference of the variables in equation (3), the following first difference equation is obtained:

$$\Delta Y_{it} = \beta_0 + \beta_1 \Delta(\text{Shareholder Wealth})_{it} + \Delta \varepsilon_{it} \quad (4)$$

where $\Delta(\text{Shareholder Wealth})_{it}$ is calculated as $(MV_{i,t-1} \times r_{it})$ according to equation (2). The increase (delta) in shareholder wealth is described as the invested capital at the beginning of the period $(MV_{i,t-1})$ multiplied by the inflation-adjusted increase in shareholder value r_{it} (i.e., increases in stock price plus dividends paid). This constitutes a common measure of shareholder wealth increase (Lueg, 2008, 2010; Lueg & Schäffer, 2010). Once the unobserved heterogeneity has been differenced out of equation (3), the values of β_0 and β_1 can be estimated using ordinary least squares (OLS) regression. Under the assumption of exogeneity in two consecutive periods, the FD estimator is unbiased and consistent (Verbeek, 2008). The efficiency of the FD estimator implies that ε_{it} follows a random walk and if this is the case,

the usual OLS standard errors are asymptotically valid (Wooldridge, 2008). Another way of dealing with panel data containing unobserved heterogeneity is by using a standard fixed effects (FE) regression model, but throughout this study, the FD estimator will be applied. Jensen and Murphy (1990b) use the FD estimator to estimate the pay-performance sensitivity which they define as the measure of CEO wealth change (in thousands) for every \$1,000 increase in shareholder wealth.

4. RESULTS

4.1. The pay-performance sensitivity

The pay-performance sensitivity is defined as the slope coefficient β_1 in the FD OLS regression in equation (4), where the value of β_1 indicates the change in CEO wealth (in thousands of dollars) associated with a \$1,000 increase in shareholder wealth. Therefore, a larger value of β_1 indicates a higher degree of alignment between CEO and shareholder wealth, which in theory should reduce the agency costs in the principal-agent relation. The only factor preventing the CEO from using their firm's funds is the decrease in the value of their shareholdings. If the CEO's compensation package is performance-based they will also be punished

economically through a smaller compensation, hence it is also relevant to calculate the pay-performance sensitivity related to all types of compensation.

4.2. Incentives generated by direct compensation

The annual base salary is independent of firm performance in all measures. The base salary is usually set to be competitive with CEOs of similar firms' compensation levels. Besides a base salary, most executives receive variable pay. This motivates executives to reach certain organizational performance objectives. One very popular type of variable pay are bonuses, which are a one-time payment tied to short-term performance goal. Lots of executives receive some sort of bonus as a part of their compensation package in our dataset: 51 percent of the CEOs received a bonus, and 47 percent have a non-equity incentive plan. These compensation methods are just some of the variables that together equal direct compensation. Table 1 summarizes estimates of the relationship between direct CEO compensation and firm performance measured by the change in shareholder wealth. The sample contains 21,882 yearly first differences in compensation and includes 3,956 executives from 1,774 firms.

Table 1. Estimates of pay-performance sensitivity: Coefficients of OLS regressions of $\Delta(\text{Salary} + \text{Bonus})$ and $\Delta(\text{Direct Compensation})$ on current and lagged $\Delta(\text{Shareholder Wealth})$

Independent variable	Dependent variable (in thousands of 1994 constant US dollar)		
	$\Delta(\text{Salary} + \text{Bonus})$		$\Delta(\text{Direct Compensation})^a$
	(1)	(2)	(3)
Intercept	980.2484	985.3356	129.1695
Change in shareholder wealth (thousands of US dollars)	0.0000136 (12.19)	0.0000132 (11.47)	0.0000131 (2.23)
Change in shareholder wealth (in year $t-1$)	...	0.0000138 (11.58)	0.0000305 (5.21)
R ²	0.0068	0.0129	0.0016
Estimated pay-performance sensitivity ^b , β	0.0000136	0.000027	0.0000436
F-statistic for β	148.68*	130.60*	16.09*
Sample size	21,876	20,057	20,057

Note: The sample is constructed from longitudinal data extracted from ExecuComp and consists of 3,956 CEOs serving in 1,774 corporations for the years 1994–2013. $\Delta(\text{Shareholder Wealth})$ is defined as the beginning-of-period market value multiplied by the inflation-adjusted rate of return on common stock with dividends reinvested. t -statistics are in parentheses. * Significant at the 0.01 percent level.

^a Direct compensation for the individual year is comprised of the following: salary, bonus, the total value of restricted stock grants, non-equity incentive plan, and other benefits but does not include the value of stock options granted or the gains for exercising stock options.

^b Estimated beta is the sum of the coefficients on the contemporaneous and lagged shareholder wealth change.

The amount of first difference observations for shareholder wealth is 21,876 so this will be the final sample size our OLS regression is based upon. Column (1) in Table 1 reports estimated coefficients from the least-squares regression in equation (4). The coefficient on the shareholder wealth variable of $\beta = 0.0000136$ and is statistically significant ($t = 12.19$), indicating a positive relationship between shareholder wealth and compensation composed of salary and bonus. The economic significance of the pay-performance sensitivity is however very low, as CEOs receive on average an additional \$1.36 for each \$1,000 increase in shareholder wealth.

The estimated coefficients in column (1) imply that a CEO receives a pay increase of \$980,248 in years in which shareholder earns a net-zero return after adjusting for inflation. The median absolute deviation (MAD) from the median in shareholder wealth change is approximately \$387 million, so the CEO pay change associated with shareholders wealth deviation is $\$387,000,000 \times 0.0000136 \approx \$5,257$.

MAD has been chosen instead of annual standard deviation, as the MAD is a robust statistic, being more resilient to extreme values in the data set than the standard deviation. Thus, the average pay increase for a CEO whose shareholders gain \$387 million is \$985,505 compared to an average pay increase of \$974,991 for a CEO whose shareholders lose \$387 million.

Equation (4) assumes that the amount the CEO is compensated is dependent on the current year, but this assumption is not always realistic. Decisions on whether to payout or retain bonuses often depend on sales, market share, revenues, customer satisfaction, and other factors that may not have been available before the fiscal year-end. To account for this, a lagged variable for shareholder wealth has been included in equation (5), thereby controlling for the uncertainty of when the bonus is determined. In our study, the term bonus comprises all forms of variable pay (e.g., stock options and cash), as opposed to the fixed salary agreements.

$$\Delta(\text{Salary} + \text{Bonus})_{it} = \beta_0 + \beta_1 \Delta(\text{Shareholder Wealth})_{it} + \beta_2 \Delta(\text{Shareholder Wealth})_{it-1} + \Delta \varepsilon_{it} \quad (5)$$

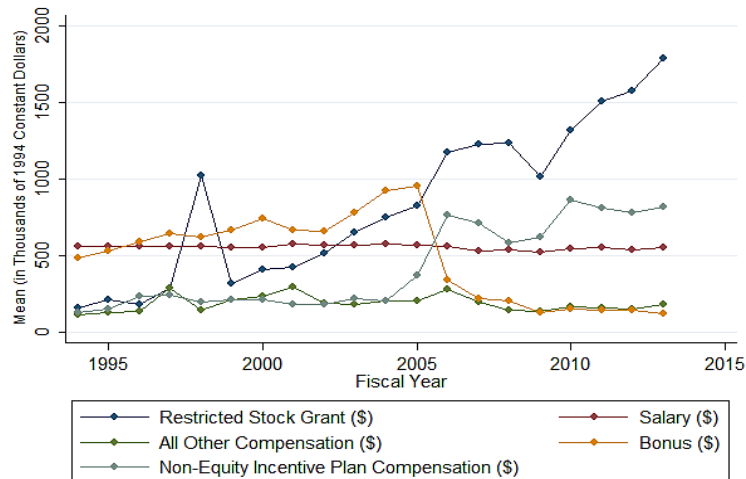
The coefficient in column (2) of Table 1 for year $t - 1$ is very significant implying last year's performance, which contributes to estimating the current compensation level with regards to salary and bonus. The total pay-performance sensitivity of 0.000027 is defined as $\beta_1 + \beta_2 \equiv \beta$, where the overall significance of the estimated model is determined by the F-statistic, which in this case is very significant ($F = 130.60$). From the estimates in column (2), it is impossible to determine the real effect of the lagged variable and how much is caused by measurement error. Adding additional lags reduces the overall significance of the model and the economic significance of the coefficients of the lagged variables provides pay-performance sensitivities in the magnitude of less than 1 cent.

Column (3) of Table 1 reports the relation between direct compensation and firm performance where direct compensations the sum of salary, bonus, total value of restricted stock granted, non-equity incentive plan, and all other benefits. The sum of the estimated coefficients on current and lagged change in shareholder wealth is $\beta = 0.0000436$, indicating that total direct compensation changes by 4.36 for each \$1,000 change in firm value. Including restricted stock grants, non-equity incentive plans, and other

benefits give more than a 60 percent increase in the pay-performance sensitivity compared to just remunerating the CEO with salary and bonus.

Figure 1 shows how the various elements of direct compensation have developed over time. All monetary variables have been adjusted for inflation and represent thousands of 1994 constant dollars to avoid the impact of inflation on compensation values. Most interestingly, the real CEO base salary is unchanged for the past 20 years. The value of restricted stock grants is the compensation variable that has experienced the highest increase. Except from 1996, 1998, and 2009, the real value of restricted stock grants has been increasing continuously since 1994, which can be attributed to the thundering stock market, as well as a desire from the shareholders of keeping base salary fixed and increasing the pay-performance sensitivity. In 2006 it appears that restricted stock grants, together with the non-equity incentive plan, is negatively correlated with bonus, as the variables experience a change in the direct opposite direction in a somewhat comparable magnitude. This event could be attributed to the fact that the Financial Accounting Standards (FAS) 123R became effective for all publicly traded firms in 2006, making executive compensation costs more transparent.

Figure 1. Breakdown of the development in total direct compensation from 1994-2013 (in thousands of 1994 constant US dollar)



Note: Keep in mind that Figure 1 only shows the mean values. The median values are lower for all yearly observations of the compensation variables and in some cases, the median is even 0. In 1998 where a spike in restricted stock grant occurred the median value is 0.

We find it rather surprising that the CEO's bonus and non-equity incentive plan are almost unchanged during the years of the financial crisis. The millions of dollars the shareholders lost are only reflected by a small decrease in restricted stock grants in 2009. However, CEO wealth is affected much more directly by changes in the value of their inside shareholdings as well as the value of their outstanding stock options.

4.3. Incentives generated by stock options

Stock options are one of the compensation methods that have gained a lot of popularity in the last couple of decades, as they provide the CEO with value-increasing incentives. Not only does a CEO receive incentives from a current stock grant, but the change in previously granted (outstanding) options also increase in value if the share price increases. At the end of each year, CEOs typically hold stock options granted in different years with different vesting periods, as well as different strike

prices. Most of the stock options granted are exotic options as they are not designed to be traded, but rather to provide the CEO with performance incentives.

In this section, we calculate the pay-performance sensitivity generated from the profits of exercising options, the fair value of options granted in the current year, and the change in the value of previously granted options based on Compustat's option valuation methodology. The fair value of options granted is a good estimate of the wealth transfer from the firm to the CEO taking place in the current year. Furthermore, the fair value of options provides consistent estimates for the value of options grants before and after

the change in reporting requirements following FAS 123R.

Column (1) in Table 2 reports least-squares regression results for 20,057 CEO year observations, in which the dependent variable is the change in the value of stock options. The sum of the estimated coefficients implies that the value of CEO stock options on average increases \$2 for each \$1,000 increase in shareholder wealth. Therefore, the monetary incentives generated by stock options are very large compared to the incentives generated by direct compensation (4.36 per \$1,000 from column (3) of Table 1). Column (2) in Table 2 reports regression coefficients in which the dependent variable is the change in all pay-related wealth (related to stock options) defined as:

$$\Delta(\text{CEO Pay Related Wealth}) = \text{Direct Compensation} + \Delta(\text{Value of Stock Options}) \tag{6}$$

Including direct compensation in the regression only increases the pay-performance sensitivity to \$2.09, but when estimating using equation (6), the intercept is a positive value compared to

column (1). The overall significance of the models in columns (1) and (2) is indisputable with F-statistics of respectively 192.87 and 187.20.

Table 2. Estimates of pay-performance sensitivity including stockholdings and options: Coefficients of OLS regressions of $\Delta(\text{CEO Wealth})$ and current and lagged $\Delta(\text{Shareholder Wealth})$

Independent variable	Dependent variable (in thousands of 1994 constant US dollar)				
	$\Delta(\text{Value of Stock Options})$	$\Delta(\text{Value of Stock Options}) +$ $(\text{Direct Compensation})$	$\Delta(\text{Value of Stock Options}) +$ $\Delta(\text{Value of Inside Stock}) +$ $(\text{Direct Compensation})$		
	(1)	(2)	(3)	(4)	(5)
Intercept, β_0	-1058.555	1705.175	1916.634	1149.071	1916.634
Change in shareholder wealth (thousands of dollars), β_1	0.0023393 (18.91)	0.0023739 (19.19)	0.0013162 (9.13)	0.0231007 (53.06)	0.0013162 (9.13)
Change in shareholder wealth in year $t-1$, β_2	-0.0003366 (-2.61)	-0.0002814 (-2.18)	-0.0002028 (-1.52)	0.0006052 (1.33)	-0.0002028 (-1.52)
CEOs fractional ownership* change in shareholder wealth, β_3	0.0368138 (16.81)	...	1.036814 (473.35)
R ²	0.0179	0.0183	0.0275	0.1231	0.9305
Estimated pay-performance sensitivity, β	0.0020027	0.0020925	0.00123489**	0.0237059	0.00453489*
F-statistic for β	192.87*	187.20*	185.36*	1408.03*	87731.75*
Sample size	20,057	20,057	19,656	20,057	19,656

Note: $\Delta(\text{Shareholder Wealth})$ is defined as the beginning-of-period market value multiplied by the inflation-adjusted rate of return on common stock with dividends reinvested. $\Delta(\text{Value of Stock Options})$ includes profits from exercising options, value of options granted in current year, and the change in the value of previously granted options based on Compustat's Black-Scholes valuation method. Direct compensation includes salary, bonus, value of restricted stock, non-equity incentive plan, and other benefits, t-statistics are in parentheses.

*Significant at the 0.01 percent level. **Estimated and related test statistic for a CEO with median fractional ownership for the sample, 0.0033.

4.4. Incentives generated by inside stock ownership

Stock ownership is a direct link between shareholder and CEO wealth, and the value of the CEO's shareholdings is independent of their performance contract. In contrary to stock options that have a lower bound of zero, a CEO can lose money if the share price falls. The possibility of losing money provides value-increasing incentives for the CEO. Yearly changes in these shareholdings easily exceeded direct compensation by orders of magnitude. For example, the average yearly change in the value of CEO stock holdings is approximately \$12 million where the average change in the value of direct compensation and the total value of stock options combined is less than \$400,000. Column (4) of Table 2 reports regression coefficients in which the dependent variable is the change in CEO wealth, including the change in the value of their inside stockholdings. Changes in the value of inside stockholdings are calculated as the value of the shares held at the beginning of the fiscal year

multiplied by the inflation-adjusted rate of return on a common stock with dividends reinvested. The sum of coefficients in column (4) implies that the wealth of the CEO increases (or decreases) by about \$2.37 whenever shareholder wealth increases by \$1,000. The large difference between the estimated β in columns (2) and (4) shows that, on average, inside stock holdings do matter when providing the CEO with monetary incentives.

The regression specification in column (2) of Table 2 assumes that the pay-performance sensitivity is constant among CEOs with different amounts of inside shareholdings. This is a daring assumption to make, β may be larger (and positive) for CEOs with high amounts of inside shareholdings. Another hypothesis could explain the exact opposite phenomena. The pay-performance sensitivity would be small (or even negative) if the CEO has too much wealth tied up to the firm's performance for their preference, hereby preferring a lower performance-pay to reduce their wealth at risk.

We test for this possible heterogeneity by re-estimating the regressions in columns (2) and (4) after including an interaction term, *CEO's Fractional Ownership* \times $\Delta(\text{Shareholder Wealth})$ to capture the effect of inside stock ownership on pay-performance sensitivity. The dependent variable in the regression in column (3) of Table 2 is the change in all pay-related wealth (including stock options but excluding stock ownership). The small but significant positive coefficient on the ownership interaction variable ($t = 16.81$) implies that the relationship between compensation and performance does depend on the CEO's inside stockholdings. This is a very interesting discovery since (Jensen & Murphy, 1990b) find the interaction variable to be insignificant ($t = 0.7$) and the coefficient to be more than ten times smaller than our finding. Jensen and Murphy (1990b) stated: "...the result that the pay-performance relation is not affected by stock ownership seems inconsistent with theory since optimal compensation contracts that provide incentives for managers to create shareholder wealth will not be independent of their shareholdings" (p. 236).

Something has changed from 1974-1986 to 1994-2013 since the pay-performance sensitivity is now significantly positively interlinked and

$$\beta = \beta_1 + \beta_2 + \beta_3 * \text{Fractional Ownership} = 0.00111343162 - 0.0002028 + 1.036814 * 0.0033 = 0.00453489 \quad (7)$$

Table 3 summarizes fractional stock ownership data for the same sample of CEOs used to estimate the pay-performance sensitivity in Tables 1 and 2. As for the distribution of compensation data being skewed, the same is the case for CEO inside stock ownership. The average CEO holds 2.27 percent of their firm's stock, where the median CEO holds only

dependent on CEO stock ownership, hereby rejecting the hypothesis that β is negatively correlated with CEO wealth through inside stockholdings. One possible implication that can be drawn from this discovery is the CEO's power to exert influence on their performance contract has decreased.

The dependent variable in the regression in column (5) of Table 2 is the change in CEO wealth, including all forms of compensation plus the change in the value of their inside shareholdings. The coefficient on the interaction term is very significant ($t = 473.35$) and close to unity (1.036814), suggesting that the pay-performance sensitivity for a CEO with nonnegligible stockholdings can be approximated by their fractional ownership. Since the total pay-performance relation is given by $\beta = 0.0011134 + 1.306814 \times \text{Fractional Ownership}$, the sensitivity for a CEO who owns no stock is equivalent, on average, to owning 1.1134 percent of the firm. The total pay-performance sensitivity for a CEO with shareholdings of 0.33 percent is equivalent to $\beta = 0.00454$, or \$4.54 per \$1,000 change in shareholder wealth. Equation (7) shows how the pay-performance sensitivity has been calculated in column (5) for a CEO with shareholdings equal to the median (0.33%).

0.33 percent. Twenty percent of the CEOs in the sample hold less than 0.07 percent, and 60 percent hold less than 0.53 percent. Small fractional ownerships are even more dominant among the largest firms (ranked according to market capitalization), where 60 percent of the CEOs hold less than 0.26 percent of their firm's common stock.

Table 3. CEO inside stock ownership summary statistics and quintile boundaries for percentage and value of CEO stock ownership for firms in the S&P 1500 Index in the time period 1994-2013

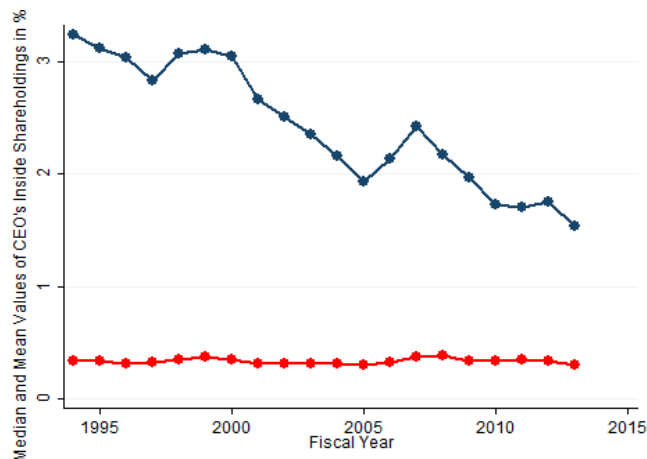
	CEO stock ownership as % of shares			Value of CEO stockholdings (\$ millions)		
	All firms (1)	Small firms (2)	Large firms (3)	All firms (1)	Small firms (2)	Large firms (3)
Mean	2.27	3.16	1.39	110.34	22.87	197.23
Median	0.33	0.63	0.18	7.92	4.44	13.16
Quantile boundaries:						
Min	Less than 0.01%			Less than \$0.1		
20%	0.07	0.16	0.05	1.82	1.03	3.82
40%	0.22	0.42	0.12	5.24	2.95	9.08
60%	0.53	0.97	0.26	12.27	6.73	19.20
80%	1.84	3.18	0.86	36.29	20.37	54.56
Max	81.13	81.13	61.39	70,982.98	1,298.81	70,982.98
Median value of firm equity (\$ millions):				1,912	731	5,820

Note: Small corporations have a market value below the sample median (1.9 billion dollars); large corporations have a market value exceeding the median. The sample is based on 23,159 CEO year observations and counts 1,774 different corporations.

In dollar terms, Table 3 shows that CEOs hold an average of over \$110.34 million of their firm's stock. Once again, the distribution is right-skewed and the median stock ownership is only \$7.92 million. While the CEOs in large firms have smaller fractional investments placed in their firm, the dollar value of their investment is in many cases multiple times larger. Two-tailed t-tests reveal that even at a 0.00001% confidence level there is a statistically significant difference between

the CEO's fractional ownership and dollar value of these in respectively small and large firms. In the period 1994-2013, the median value of the CEO's inside shareholdings have been extremely constant, which can be seen in Figure 2. The mean value, however, has been experiencing a downward trend which we have found is attributed to the upper deciles of CEOs (ranked by market capitalization), who have been unloading their shareholdings.

Figure 2. Development of CEO's mean and median inside stock ownership in percentage for firms in the S&P 1500 in the time period 1994–2013



Note: Blue represents the mean values, red the median. The sample is based on 23,159 CEO year observations and counts 1,774 different firms.

4.5. The total pay-performance sensitivity

Aggregating all the individual pay-performance sensitivities generated by direct compensation, stock options, and inside stockholdings, it is possible to obtain an estimate of the total pay-performance sensitivity. The pay-performance sensitivity generated by direct compensation is 4.4 (column (3) of Table 1), adding this result to the pay-performance of \$2 from stock options (column (1) of Table 2) yields a total monetary incentive of \$2.04 per \$1,000 increase in shareholder wealth. Then, adding the stock-ownership sensitivity of \$3.30 per \$1,000 for a CEO with median holdings, yields a total pay-performance sensitivity of \$5.34 per \$1,000 change in shareholder wealth ($\beta \approx 0.00534$). Principal-agent theory predicts that compensation will tie the agent's expected utility to the principal's objective (Jensen & Murphy, 1990b). This entails that the CEO will seek to reach the same goal as the principal; maximizing shareholder wealth. The empirical evidence presented in Section 4 proves that the CEO has some monetary incentive to increase shareholder wealth as changes in the CEO's pay-related wealth is positive and significantly related to shareholder wealth. However, the magnitude of the pay-performance sensitivity is not very large. We can conclude that agency costs are not eliminated, but the CEO does have some monetary incentives to pursue the shareholder's objective.

5. DISCUSSION: CAN THE ESTIMATED PAY-PERFORMANCE SENSITIVITY ALLEVIATE AGENCY COSTS?

5.1. Comparison to Jensen and Murphy's findings from 1974–1986

Jensen and Murphy (1990b) estimated that the total pay-performance is \$3.25 including direct compensation, stock options, dismissal costs, and inside stockholdings. If the cost of dismissal is subtracted, then the pay-performance is \$2.95. Besides the dismissal costs, there is a slight

difference between the way Jensen and Murphy (1990b) and we have estimated the incentives generated from direct compensation.

Jensen and Murphy (1990b) argue that a more appropriate measure for the change in CEO wealth is direct compensation plus the discounted present value of the change in salary and bonus. However, because the future salary and bonus cash flows are of such an uncertain character we have chosen to omit them from our analysis. Compensation changes may be transitory and the length of the future cash flows is unknown as, e.g., employment length is subject to change due to retirement and dismissal. In Jensen and Murphy's (1990b) regression, the pay-performance sensitivity estimate increases from 3 to 30 when the discounted present value is accounted for, which could indicate that our estimate of 4 might be closer to 40 if the same cash flow growth and discount factor are applied. To make our estimate of \$5.34 comparable, $30 - 3 = 27$ must be subtracted from Jensen and Murphy's estimate providing a pay-performance of \$2.68. From 1974–1986 to 1994–2013, the total pay-performance sensitivity related to direct compensation, stock options, and inside shareholdings has increased by \$2.66, or almost doubled.

The monetary incentives generated by stock options have changed a lot since Jensen and Murphy (1990b) conducted their analysis almost thirty years ago. Back then, the pay-performance sensitivity attributed to stock options was just \$0.15, today (1994–2013) it is approximately \$2, which column (1) of Table 2 shows. This increase of more than thirteen times in pay-performance sensitivity related to stock options is one of the most interesting findings in this study. Stock options have gone from comprising a minor role in performance pay to being a major driver of economic incentives for a CEO.

The median of inside stockholdings in percentage has increased marginally among all firms to 0.33% from 0.25% as well as large firms (1.39%) and small firms (3.16%) have experienced a small increase. Evidently, the median CEO shareholding in percentage has stabilized around 0.30% in the past two decades, as shown in Figure 2. The mean of

CEO's fractional stockholdings has increased for small firms, but decreased for all firms and large firms, compared to back in 1987.

Table 4. Time trend in CEO inside stock ownership for the 120 largest firms ranked by market value

Year	Median percentage of firm owned
1938	0.30%
1974	0.05%
1984	0.03%
1994	0.07%
2004	0.05%
2013	0.06%

Note: The results from 1938, 1974, and 1984 are from Jensen and Murphy (1990b).

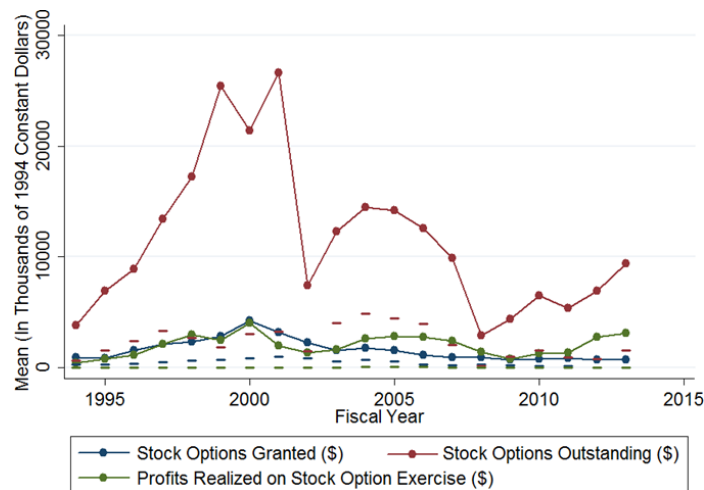
Our interpretation of a decrease in the mean percentage value among the large firm's subcategory is that the CEOs of the largest firms (upper deciles) in our sample have reduced their shareholdings. However, Table 4 shows that the CEO's median inside shareholdings of the 120 largest firms have not decreased. We hypothesize that CEOs of large firms, in general, have lowered their inside shareholdings, except the CEOs of the largest firms (top 120). The reason for this is that there is much more attention directed towards the 120 largest firms in the U.S. and with this attention comes to focus on CEO behavior, compensation, etc.

Contrasting the estimated sample in 1994-2013 and Jensen and Murphy's study, the change in pay-performance sensitivity generated from inside stockholdings stems from the difference in the samples' respective median values. The change of $0.33\% - 0.25\% = 0.08\%$ point equals a monetary gain of \$0.80 per \$1,000. This value (\$0.80) is a

relatively large share of the total pay-performance sensitivity of \$5.34 per \$1,000, especially when considering the amount that direct compensation constitutes.

Contrary to Jensen and Murphy (1990b), we find that the pay-performance sensitivity is positively correlated with the CEO's inside stock ownership. This heterogeneity in our regression could indicate that CEOs have less influence on the design of their compensation contract. CEOs with high inside stockholdings do not have the power to lower their pay-performance sensitivity, nor do CEOs with negligible shareholdings have large performance-pay incentives. Another inference is that when shareholders acknowledge the importance of high pay-performance sensitivity, they require the CEO to maintain a higher number of inside shareholdings, and besides, the CEO is largely remunerated using options. This combination results in a higher pay-performance sensitivity and it explains the positive correlation between the observed inside stock ownership and the estimated pay-performance sensitivity. During the 1980s and 1990s, firms drastically increased the use of option-based compensation. The development of stock option issuance in the 1990s can be seen in Figure 3. One of the reasons for this change in compensation structure is the provision of the Omnibus Budget Reconciliation Act of 1993 (OBRA-93) that eliminated tax deductibility of executive compensation above one million dollars. Performance-based compensation such as bonuses, stock awards, stock options is exempt from this legislation.

Figure 3. Breakdown of the development in total option compensation from 1994-2013 (in thousands of 1994 constant US dollar)



Note: The line graphs with dots represent the mean values and the small horizontal lines represent the median values. For all observations, the median lies below the mean which indicates the distribution is left-skewed (negative skewness), where few CEOs receive very large values of compensation through options.

Bebchuk and Fried (2004) argue that executives used their influence to obtain substantial stock options without giving up corresponding amounts of their cash compensation. They further posited that the options the CEOs received did not link compensation to performance, but rather enabled executives to reap a windfall since the stock market, in general, was performing well. Another argument,

that could explain the increase in stock options, is a desire to raise CEO compensation and at the same time avoid public outcry. This stems from stock options being perceived as a more fair and opaque method of remunerating executives.

To examine the effect on the pay-performance sensitivity caused by the increase in stock options, Hall and Liebman (1998) also calculated the Jensen

and Murphy's statistic and found a dramatic increase in the incentives generated by stock options, consistent with the results presented in the prior section. The conclusion is drawn by Hall and Liebman (1998) is: "We find that virtually all of the pay to performance sensitivity is attributable to changes in the value of CEO holdings of stock and stock options" (p. 654), which still seems to be the case today.

OBRA has not been the only legislation favoring performance-based compensation structures. Recognizing that stock options became increasingly popular following OBRA, Financial Accounting Standards Board (FASB) issued FAS 123 in 1995, encouraging firms to use the fair value of stock options instead of the intrinsic value. The intrinsic evaluation usually caused no compensation expense on financial statements as the majority of stock options are granted at-the-money. FAS 123 did not quite have the intended effect, since most firms continued to use the intrinsic value for stock option evaluation. In 2004 FASB announced FAS 123R, a new accounting standard requiring firms to expense the costs associated with stock options payments on financial statements to reflect the economic transaction taking place, even though the real costs remains zero until the options are exercised (FASB, 2004; Adkins, 2013).

5.2. Small pay-performance sensitivity: contributions to theory and practice

We contribute with several ideas which estimated pay-performance sensitivity is rather small, and why it has not increased more. First, there is a clear trend to define firm success in other ways than shareholder wealth, and to include the view of relevant stakeholders as well. Due to having different objectives, these internal and external organizational forces can potentially impose a practical limit on CEO compensation. Refraining from rewarding a CEO with high compensation following exceptional performance reduces the pay-performance sensitivity and monetary incentives.

Second, the *absolute* amounts of compensation for CEO has reached historic highs. Some CEO might be so wealthy that a further increase in their wealth does not substantially increase their happiness. As shareholders suspect this, the pay-performance mechanisms might have reached a level of saturation.

A third explanation — but rather controversial alternative to our second point — might be that CEOs do not act on incentives but their innate abilities and competencies. From this viewpoint, pay-performance sensitivity and performance contracts would be of limited use. However, one might consider that non-pecuniary incentives also play a part in motivating a CEO to do their job. This would speak in favor of looking more into non-pecuniary incentives in future research.

Fourth, a small pay-performance sensitivity could imply that the CEO may not be an important agent for the shareholders. If the CEO is unimportant and the board of directors can easily monitor the CEO's actions by observing their input (work effort, decision making) and output (profits, share price) factors, a high pay-performance is not required. As long as the board has good information

about the CEO's decision-making processes, the CEO is at high risk of being exposed to being incompetent, which itself is a motivational factor. When the CEO is aware of this, the need to put a lot of weight on the CEO's output in determining the amount of compensation is low, as the CEO input factors are observable. Therefore, pay-performance practitioners advocate that a higher pay-performance sensitivity is required in industries where the CEO has more possibilities to consume on the job and the CEO's inputs are harder to monitor (Jensen & Murphy, 1990b).

6. CONCLUSION

Our analysis of the pay-performance sensitivity of 3,956 CEOs serving in 1,774 firms, in the S&P Index for the years 1994–2013, indicates that the link between CEO and shareholder wealth is still small, even though it has increased compared to when the Jensen and Murphy's statistic first was calculated. The conclusions of our research are as follows:

1. On average, each \$1,000 change in shareholder wealth corresponds to a change in this year's and next year's bonus and salary of 2.7 cents for the CEO. Including all of the other direct compensation components the pay-performance sensitivity increases to 4.36 cents for each \$1,000 change in shareholder wealth.

2. In comparison to direct compensation, option-based compensation is a much larger driver of the CEO's incentives. Not only does a CEO receive incentives from a current stock grant, but the change in previously granted (outstanding) options also increase in value if the share price increases. The pay-performance sensitivity generated from option-based compensation indicates that CEO wealth changes by approximately \$2 per \$1,000, which is 13 times larger than Jensen and Murphy's estimate of the stock option pay-performance sensitivity and 46 times larger than incentives generated from direct compensation (4.36 cents).

3. Stockholdings are indisputably the strongest link between CEO and shareholder interests, as the risk and monetary sharing rate is one-to-one between the principal and agent. Median CEO inside stockholdings in the period 1994–2013 is 0.33%, and 80% of these CEOs hold less than 1.84% of their firms' shares. The median ownership for large firms is 0.18% and for small firms, 0.63%, indicating the size of the firms affect the CEO's pay-performance sensitivity. A positive and significant relationship has been found between the CEO's inside stock ownership and the pay-performance sensitivity, so incentives for managers to create shareholder wealth will not be independent of their shareholdings.

4. The total pay-performance sensitivity generated from direct compensation, stock options, and inside stockholdings equals $\beta \approx 0.00534$, which indicates that CEO wealth changes by \$5.34 per \$1,000 change in shareholder wealth. Applying the same estimation procedure from 1974–1986, Jensen and Murphy estimate a pay-performance sensitivity of \$2.68 so in the period 1994–2013, it has almost doubled in value. Today the relationship between pay and performance is almost entirely

driven by changes in the value of stockholdings and stock options.

Despite the increased pay-performance sensitivity, it seems unrealistic to assume that the current economic sharing rate between the agent and principal can offset the agency cost phenomena. Following the large increase in option-based compensation, the pay-performance sensitivity is moving in the right direction, but much more can be done to provide CEOs with incentives. Option-based compensation contains a lot of possibilities to accommodate the risk-averse CEO's investment preferences, which the shareholders should utilize.

The lack of a strong pay-performance deserves further consideration, especially in the light that firm goals have become broader and stakeholder groups more numerous (e.g., relating to sustainability), and that CEOs might alternatively react to non-pecuniary incentives. Potentially, some of the stakeholders of the CEO are imposing compensation constraints, which directly and indirectly, limits the pay-performance sensitivity. Future research should further investigate the logics behind this.

Our findings link in several way to the existing literature. First, we can confirm that the pay-performance relationship with firm value holds to different degrees (for a comprehensive literature review, see Edmans et al., 2017). Recent research has even found that this relationship increases under different moderator variables, such as board independence (Ntim et al., 2019; Agrawal & Nasser, 2019), shareholder activism (Clifford & Lindsey, 2016), or sustainability targets (Maas, 2018). Second, our results confirm recent findings that pay-performance sensitivity has increased over time. Like us, Bettis, Bizjak, Coles, and Kalpathy (2018) find that CEOs have received larger performance-vesting equity awards in the past two decades. Our results are also in line with Guay, Kepler, and Tsui (2019), who find that pay-performance sensitivities have increased recently. Shue and Townsend (2017) offer an explanation why pay has increased so steeply. They attribute this to the fact that the number of stock options given has remained constant in many firms. Reasons for this were psychological biases of *number rigidity* and *money illusion*, as well as lacking skill of option valuation. Consequently, the value of the same number of options has increased disproportionately with increased equity returns over the past decades.

There are some issues relating to how the Jensen and Murphy's statistic is estimated. By calculating how CEO and shareholder wealth covary as an indicator of the pay-performance sensitivity, total compensation (employment reward) and ownership gains (the investment reward) are mixed (Donlon, Meredith, Jensen, & Murphy, 1990). From this perspective, pay-performance sensitivity is a misleading name as it is not only pay-related.

The estimated pay-performance sensitivity is easily interpreted as the sharing rate, but analyzing the sharing rate β in isolation gives an incomplete picture of the optimality of the CEO's incentive contract. Even with a small pay-performance sensitivity, a CEO can experience massive wealth changes if their firm increases a lot in value. Hall and Liebman (1998) points out that the pay-performance sensitivity only accounts for absolute changes in shareholder wealth, neglecting the importance of relative wealth change. Even with

the same pay-performance sensitivity, a CEO who manages to grow their firm by 100% might receive less in compensation than a CEO who only manages to grow their firm by 1%, provided that the 1% is larger in absolute value. Larger firms are more likely to experience larger (absolute) fluctuations in market value than smaller firms are. In effect, a lower pay-performance sensitivity is needed to remunerate a CEO in a large firm by the same amount as a CEO in a smaller firm.

The estimated pay-performance sensitivity does not fully explain how the CEO's wealth is connected to the shareholders. There are additional factors that indirectly affect the CEO's wealth which this study does not cover, e.g., pension plans and stealth compensation. Stealth compensation could, for example, include benefits such as firm loans, healthcare, insurance, home security systems, financial planning among other services.

Jensen and Murphy (1990b) also estimate the personal cost of dismissal for every CEO and include this average dismissal cost of \$0.30 in their estimate of the total pay-performance sensitivity. However, as highlighted earlier, we have chosen to omit dismissal costs in our analysis because that would be a relatively imprecise estimate, as we do not have data on CEO termination conditions. In our opinion, the termination conditions are vital to the analysis, as the golden parachute agreement can potentially reduce or eliminate the monetary punishment of failure.

Another factor that could increase the pay-performance sensitivity is that good CEO performance could potentially lead to other job positions with higher compensation. Indirectly this personal investment the CEO makes to be more value-maximizing in the present, might result in a high future payoff for the CEO if they believe in their advancement abilities.

It is important to realize that there are other performance-pay measures than the Jensen and Murphy (1990b) statistic this study has revolved around. Hall and Liebman (1998) have calculated different measures of how CEO wealth changes according to firm performance. The impact on CEO compensation when moving from the 50th percentile (5.9% stock return) to the 70th percentile (20.5% stock return) in the market was a mean (median) change of 9.58 (1.82) million in 1994 US dollar or 70.8% (57.6%) in CEO compensation. Besides comparing how CEO wealth varies when beating the median return, Hall and Liebman (1998) calculate the CEO pay to performance elasticity to express the wealth correlation in percent between the principal and agent. To conclude whether the current pay-performance incentives are sufficient to alleviate the agency problem, further research needs to be done regarding how CEO wealth varies with performance. The Jensen and Murphy's statistic only contains limited information on the connection between performance and pay, but it is a useful proxy for the degree of coinciding monetary interests.

Concluding, this study investigates the relation between CEO and shareholder wealth. We find a significant increase compared to Jensen and Murphy's estimate. Further research on how CEO wealth varies with firm performance, both absolute and relative to other firms, is required to determine if the CEO is the shareholder value-maximizing agent whom the principal seeks.

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