

# CEO Compensation

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## Abstract

This paper surveys the recent literature on CEO compensation. The rapid rise in CEO pay over the last 30 years has sparked an intense debate about the nature of the pay-setting process. Many view the high level of CEO compensation as the result of powerful managers setting their own pay. Others interpret high pay as the result of optimal contracting in a competitive market for managerial talent. We describe and discuss the empirical evidence on the evolution of CEO pay and on the relationship between pay and firm performance since the 1930s. Our review suggests that both managerial power and competitive market forces are important determinants of CEO pay, but that neither approach is fully consistent with the available evidence. We briefly discuss promising directions for future research.

## Key Words

Executive compensation, managerial incentives, incentive compensation, equity compensation, option compensation, corporate governance

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## Introduction

Executive compensation is a complex and contentious subject. The high level of CEO pay in the U.S. has spurred an intense debate about the nature of the pay-setting process and the outcomes it produces. Some argue that large executive pay packages are the result of powerful managers setting their own pay and extracting rents from firms. Others interpret the same evidence as the result of optimal contracting in a competitive market for managerial talent. This survey summarizes the research on CEO compensation and assesses the evidence for and against these different explanations.

Our review suggests that both managerial power and competitive market forces are important determinants of CEO pay, but that neither approach alone is fully consistent with the available evidence. The evolution of CEO compensation since WWII can be broadly divided into two distinct periods. Prior to the 1970s, we observe low levels of pay, little dispersion across top managers, and moderate pay-performance sensitivities. From the mid-1970s to the early 2000s, compensation levels grow dramatically, differences in pay across managers and firms widen, and equity incentives tie managers' wealth closer to firm performance. None of the existing theories offers a fully convincing explanation for the apparent regime change that occurred during the 1970s, and all theories have trouble explaining some of the cross-sectional and time-series patterns in the data.

Many of the theoretical studies we review explore how various characteristics of real-world compensation contracts can be consistent with either rent extraction or optimal contracting. While obviously useful, demonstrating that any given compensation feature can arise in an optimal contracting (or rent extraction) framework provides little evidence that the feature is in fact used for efficiency reasons (or to extract rents). Partly as a result, there is no consensus on the relative importance of rent extraction and optimal contracting in determining the pay of the typical CEO. To help answer this question, models of CEO pay will have to produce testable predictions that differ between the two approaches.

We expect that the emergence of new data and the renewed interest in theoretical work on CEO pay will deliver both the predictions and the testing opportunities needed to resolve this debate.

Promising recent contributions have examined the effects of exogenous changes in the contracting environment on CEO compensation, firm behavior, and firm performance. For example, industry deregulations have been linked to higher CEO compensation, suggesting that increased demand for CEO talent raises pay levels. On the other hand, declines in CEO compensation following regulations that strengthen board oversight suggest rent extraction.

The literature on CEO compensation is vast, and this survey makes no attempt to be comprehensive. Instead, we emphasize recent contributions, and especially contributions made since the seminal review by Murphy (1999). Our focus is on empirical work more than theory, on U.S. rather than foreign evidence, and on public instead of private firms. The large segments of the literature we ignore have been ably covered in other surveys, starting with Rosen (1992) and followed by, among others, Finkelstein & Hambrick (1996), Abowd & Kaplan (1999), Murphy (1999), Core, Guay & Larcker (2003), Aggarwal (2008), Bertrand (2009), and Edmans & Gabaix (2009).

The paper is organized as follows. Section 1 describes the evidence on the level and structure of CEO compensation. Section 2 examines the relationship between CEO pay and firm performance. Section 3 summarizes and critiques explanations for the rise in CEO pay. Section 4 discusses the effects of CEO pay on firm behavior and value. The final section concludes.

## **Section 1: The level and structure of CEO compensation**

### **1.1 The level of CEO compensation**

The rapid increase in CEO pay over the last 30 years has been widely documented and analyzed in both the popular press and academic research. Taking a longer-run perspective, Figure 1 presents the evolution of annual compensation for the three highest-paid executives in large U.S. firms from 1936 to 2005. The data is from Frydman & Saks (2010), who identify the 50 largest public firms in 1940, 1960, and 1990 (for a total of 101 firms) and collect information on executive compensation in these firms for all available years from 1936 to 2005. Total compensation is the

sum of the executive's salary, current bonuses and payouts from long-term incentive plans (paid in cash or stock), and the Black-Scholes value of stock option grants.<sup>1</sup>

Figure 1 reveals three distinct phases in the growth of executive compensation that form a J-shaped pattern over the 1936 – 2005 period. Following a sharp decline during World War II and a further slow decline in the late 1940s, the real value of top executive pay increased slowly from the early-1950s to the mid-1970s (averaging about 0.8% growth per year from 1950 to 1975). The rapid growth in executive pay only started in the mid-1970s and continued almost until the end of the sample in 2005, reaching its apex in the late 1990s with growth rates of more than 10% per year. Moreover, Figure 1 also shows that CEO pay grew more rapidly than the pay of other top executives during the past 30 years, but not before. The median ratio of CEO compensation to that of the other highest-paid executives was stable at about 1.4 prior to 1980 but has since then risen to almost 2.6 in the 2000-05 period.

Figure 1 suggests that the last 30 years were an exceptional period in the history of executive compensation in the U.S. The surge in executive pay since the 1970s has been replicated in larger cross-sections by many other studies.<sup>2</sup> To zoom in on the evolution of pay in recent years, Table 1 shows compensation levels from 1992 to 2008 for CEOs and other top executives in S&P 500 firms, in a sample of mid-cap firms, and in a sample of small-cap firms. Executive compensation has been increasing for firms of all sizes. For CEOs of S&P 500 firms, the median level of pay climbed rapidly from \$2.3m in 1992 to a peak of \$7.2m in 2001. CEO pay did not resume its rise after 2001, and median pay in the S&P 500 has remained stable at levels between \$6m and \$7m throughout the 2000s.

Beyond the overall rise in pay, Table 1 reveals three important facts. First, changes in CEO pay are exacerbated when focusing on average instead of median compensation, because the distribution of compensation is highly skewed. For example, median CEO pay in the S&P 500 grew by 213 percent from 1992 to its peak in 2001, while the increase in average pay was a much steeper 310

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<sup>1</sup> Black-Scholes values are likely to overstate both the cost of option compensation to the firm and its value to the executive (Lambert et al. 1991, Carpenter 1998, Meulbroek 2001, Hall & Murphy 2002, Ingersoll 2006, Klein & Maug 2009, Carpenter et al. 2010).

<sup>2</sup> See, for example, Jensen & Murphy (1990a), Hall & Liebman (1998), Murphy (1999), and Bebchuk & Grinstein (2005).

percent. Focusing on medians is therefore important if the goal is to analyze the experience of a typical CEO. Second, comparing executive pay in large-cap, mid-cap, and small-cap firms reveals interesting differences. Although executive pay has increased across the board, the growth has been much steeper in larger firms. As a result, the compensation premium for managing a larger firm has increased. Finally, for firms of all sizes, the growth in pay has been larger for CEOs than for other top executives, raising the compensation premium for CEOs.

### **1.2 The main components of CEO pay**

Despite substantial heterogeneity in pay practices across firms, most CEO compensation packages contain five basic components: salary, annual bonus, payouts from long-term incentive plans, restricted option grants, and restricted stock grants. In addition, CEOs often receive contributions to defined-benefit pension plans, various perquisites, and, in case of their departure, severance payments. The relative importance of these compensation elements has changed considerably over time.

Panel A of Figure 2 illustrates the importance of the major pay components for CEOs of large firms from 1936 to 2005, using again the Frydman & Saks (2010) data. From 1936 to the 1950s, CEO compensation was composed mainly of salaries and annual bonuses. Bonuses are typically non-discretionary, tied to one or more measures of annual accounting performance, and paid in either cash or stock. Payments from long-term incentive plans, which are bonus plans based on multi-year performance, started to make a noticeable impact on CEO pay in the 1960s. These long-term rewards are often paid out over several years, again with payment in either cash or stock.

The most striking pattern in Figure 2 is the surge in stock option compensation starting in the early 1980s. The purpose of option compensation is to tie remuneration directly to share prices and thus give executives an incentive to increase shareholder value. The use of stock options was negligible until 1950, when a tax reform permitted certain option payoffs to be taxed at the much lower capital gains rate rather than as labor income. Although many firms responded by instituting stock option plans, the frequency of option grants remained too small to have much of an impact on median pay levels until the late 1970s.

During the 1980s and especially the 1990s, stock options surged to become the largest component of top executive pay. Panel B of Figure 2 illustrates this development for S&P 500 CEOs from 1992 to 2008.<sup>3</sup> Option compensation comprised only 20% of CEO pay in 1992 but rose to a staggering 49% in 2000. Thus, a significant portion of the overall rise in CEO pay is driven by the increase in option compensation. The growth in stock option use did not occur at the expense of other components of pay; median salaries rose from \$0.8 to \$0.9 million and short- and long-term bonuses from \$0.6 to \$1 million over the same period. After the stock market decline of 2000-01, stock options seem to have lost some of their luster, both in relative and absolute terms, and restricted stock grants have replaced them as the most popular form of equity compensation by 2006. It is likely that both the prior decline in the stock market and the advent of option expensing in 2004 have contributed to the declining popularity of stock options.<sup>4</sup> This intriguing shift away from options has not yet attracted much attention in the academic literature, and further research is needed to determine its causes and consequences.

### **1.3 Other forms of pay**

Three important components of CEO compensation that have received less attention in the literature are perquisites, pensions, and severance pay. Obtaining comprehensive information on these forms of pay has, until recently, been difficult. Because of the insufficient disclosure, perquisites, pensions and severance pay have often been labeled “stealth” compensation that may allow executives to surreptitiously extract rents (Jensen & Meckling 1976, Jensen 1986, Bebchuk & Fried 2004). However, these forms of pay may also arise as the result of optimal contracting. For example, perks may be optimal if the cost of acquiring goods and services that the manager desires is lower for the firm (Fama 1980), or if they aid managerial productivity and thereby increase shareholder value (Rajan & Wulf 2006). Defined benefit pensions can be justified as a form of “inside debt” that mitigates risk-shifting problems by aligning executives’ incentives with those of lenders (Sundaram & Yermack 2007, Edmans & Liu 2010).

The evidence on the size of perquisites is limited, and empirical work on their effects and determinants has found mixed results. Perks encompass a wide variety of goods and services

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<sup>3</sup> The evolution was similar for other top executives in S&P 500 firms and for S&P MidCap and S&P SmallCap firms.

<sup>4</sup> Hall & Murphy (2003) and Bergman & Jenter (2007) argue that managers are more willing to accept options after stock market booms.

provided to the executive, including the personal use of company aircraft, club memberships, and loans at below-market rates. Consistent with the rent-extraction hypothesis, shareholders react negatively when firms first disclose the personal use of company aircraft by the CEO (Yermack 2006a). Average disclosed perquisites increased by 190% following an improvement in the SEC's disclosure rules in December 2006, suggesting that firms previously found ways to obfuscate the reporting of perks (Grinstein et al. 2009). Reductions in firm value upon the revelation of perks substantially exceed the actual cost of the perks, suggesting that perk consumption may be a more general signal of weak corporate governance (Yermack 2006a, Grinstein et al. 2009). Thus, the available evidence indicates that at least some perk consumption is a reflection of managerial excess and reduces shareholder value. On the other hand, Rajan & Wulf (2006) provide evidence that perks are used consistently with their productivity-enhancement hypothesis, e.g., to help the most productive employees save time. The extent to which perks are justified by the efficient mechanisms proposed by Fama (1980) or Rajan & Wulf (2006) remains an open question.

The empirical evidence on pensions is even sparser than for perquisites. Prior to December 2006, SEC disclosure rules did not require firms to report the actuarial values of executive pensions. In their absence, Sundaram and Yermack (2007) use their own calculations, and estimate annual increases in pension values to be about 10% of total pay for Fortune 500 CEOs. Similarly, Bebchuk & Jackson (2005) find large pension claims in a small sample of S&P 500 CEOs. Conditional on having a pension plan, the median actuarial value at retirement is around \$15 million, which corresponds to roughly 35% of the CEO's total compensation throughout her tenure. These findings suggest that ignoring pension benefits can cause a significant underestimation of total CEO pay.

A lack of readily available data has also hampered the study of severance pay. Researchers have collected information from employment contracts, separation agreements, and other corporate filings for usually small samples of firms. Yermack (2006b) finds that golden handshakes (that is, separation pay that is awarded to retiring or fired CEOs) are common, but usually moderate in value. Rusticus (2006) shows that ex-ante separation agreements signed when CEOs are hired are also common, and equivalent to two years of cash compensation for the typical CEO. Finally, many CEOs receive a substantial special severance payment, called a "golden parachute", if they lose their job due to their firm being acquired. The stock market tends to react positively to the

adoption of golden parachute provisions (Lambert & Larcker 1985), and such provisions have become widespread during the 1980s and 90s (Hartzell et al. 2004). As with perks and pensions, research has not yet conclusively determined whether severance pay is a form of rent extraction or part of an optimal contract.<sup>5</sup>

#### **1.4 Brief summary**

Both the level and the composition of CEO pay have changed dramatically over time. The post-WWII era can be divided into at least two distinct periods. Prior to the 1970s, we observe fairly low levels of pay, little dispersion across top managers, and only moderate levels of equity compensation. From the mid-1970s to the end of the 1990s, all compensation components grow dramatically, and differences in pay across executives and firms widen. By far the largest increase comes in the form of stock options, which become the single largest component of CEO pay in the 1990s. Finally, average CEO pay declined from 2000 to 2008, and restricted stock grants have replaced stock options as the most popular form of equity compensation. It is arguably too early to judge whether the post-2001 period constitutes a third regime in CEO compensation, or just a temporary anomaly caused by the technology bust of 2000-01 and the financial crisis of 2008.

## **Section 2: The sensitivity of CEO wealth to firm performance**

The principal-agent problem between shareholders and executives has been a central concern ever since the separation of corporate ownership from corporate control at the turn of the twentieth century (Berle & Means 1932). If managers are self-interested and if shareholders cannot perfectly monitor them (or do not know the best course of action), executives are likely to pursue their own well-being at the expense of shareholder value. Anecdotal and quantitative evidence on executives' perquisite consumption, overinvestment, and empire building suggests that the principal-agent problem is salient and potentially highly detrimental to firm values (Jensen & Meckling 1976, Jensen 1986, Morck et al. 1990).

Executive compensation can be used to partly alleviate the agency problem by aligning managers' interests with those of shareholders (Jensen & Meckling 1976). In principle, an executive's pay

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<sup>5</sup> See Almazan & Suarez (2003) and Inderst & Mueller (2009) for models of optimal severance pay.



should be based on the most informative indicator(s) for whether the executive has taken actions that maximize shareholder value (Holmström 1979, 1982). In reality, because shareholders are unlikely to know which actions are value-maximizing, incentive contracts are often directly based on the principals' ultimate objective, i.e., shareholder value.<sup>6</sup> By effectively granting the executive an ownership stake in her firm, equity-linked compensation creates incentives to take actions that benefit shareholders. The optimal contract balances the provision of incentives against exposing risk-averse managers to too much volatility in their pay.

### **2.1 Quantifying managerial incentives**

Measuring the incentive effects of CEO compensation has been a central goal of the literature since at least the 1950s. Early studies focused on identifying the measure of firm scale or performance (e.g., sales, profits, or market capitalization) that is most relevant in explaining differences in the level of pay across firms (Roberts 1956, Lewellen & Huntsman 1970). This question has remained largely unresolved, mostly due to colinearity in the different size and performance measures. Instead, the next generation of studies has tried to quantify managerial incentives by relating changes in executive pay to stock price performance (Murphy 1985, Coughlan & Schmidt 1985). Although these studies verify the predicted positive relationship between executive compensation and shareholder returns, by focusing on current pay, they systematically underestimate the level of incentives (Benston 1985, Murphy 1985). Executives typically have considerable stock and option holdings in their employer, which directly tie their wealth to their employer's stock price performance. For most executives, the direct wealth changes caused by stock price movements are several times larger than the corresponding changes in their annual pay.

Conceptually, a comprehensive measure of incentives should take all possible links between firm performance and CEO wealth into account. These links include the effects of current performance on current and future compensation, on the values of stock and option holdings, on changes in non-firm wealth, and on the probability that the CEO is dismissed. Jensen & Murphy (1990a) are the first to integrate most of these effects in a study of large publicly-traded U.S. firms for the 1974–86 period. They find an increase in CEO wealth of only \$3.25 for every \$1,000 increase in

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<sup>6</sup> In practice, CEO compensation is linked to both stock prices and accounting performance. Because stock prices are a noisy measure of CEO performance, it can be optimal to supplement them with other variables that inform about CEO actions (Holmström 1979, Lambert & Larker 1987, Baker 1992).

firm value, and conclude that corporate America pays its CEOs like bureaucrats (Jensen & Murphy 1990b). However, in response, Hall & Liebman (1998) dispute the view that CEO incentives are widely inefficient on two grounds. First, the increase in stock option compensation since the 1980s has substantially strengthened the link between CEO wealth and performance. Second, they argue that the changes in wealth caused by typical changes in firm value are in fact large. Even though executives' fractional equity holdings are small, the dollar values of their equity stakes are not. As a result, the typical executive stands to gain millions from improving firm performance.

The juxtaposition of the Jensen-Murphy (1990a) and Hall-Liebman (1998) findings highlights that alternative measures of pay-performance sensitivities can lead to very different views on the magnitude of incentives. This divergence is illustrated in Table 2, which presents long-run evidence on the Jensen-Murphy measure ("dollar change in wealth for a dollar change in firm value", or simply the *fractional equity ownership*) and the Hall-Liebman measure ("dollar change in wealth for a percentage change in firm value", i.e., the value of *equity-at-stake*). To calculate these sensitivities, we follow the literature and use two approximations: First, we consider only changes in executive wealth that are driven by revaluations of stock and option holdings. This channel has swamped the incentives provided by annual changes in pay for most of the twentieth century (Hall & Liebman 1998, Frydman & Saks 2010). Second, we follow Core & Guay (2002a) and use an approximation to measure the sensitivity of executives' option portfolios to the stock price.

Table 2 presents the evolution of the fractional ownership and equity-at-stake statistics in each decade from 1936 to 2005 for the top-3 executives in large U.S. firms. The two measures show a fairly similar pattern over time: median incentives declined sharply in the 1940s, recovered in the next two decades, shrank again in the 1970s, and have steadily increased since the 1980s (columns 1 and 2). However, the statistics paint a very different picture of the strength of incentives towards the end of the sample period. Based on equity-at-stake, incentives have been higher than their 1930s level in every decade since the 1960s, reaching a peak in the 2000-05 period at 12 times their level in the 1936-40 period. In stark contrast, the fractional ownership statistic has not even regained its pre-World War II value.

The divergence in the level of these two incentive measures in recent years is mostly due to the growth in firm values over time: Executives tend to own smaller percentage (and larger dollar) stakes in larger firms, with the result that firm growth leads to lower fractional ownership incentives but higher equity-at-stake incentives (Garen 1994, Schaefer 1998, Baker & Hall 2004, Edmans et al. 2009).<sup>7</sup> Nevertheless, both measures rose from the 1970s to the 2000s despite further increases in firm size, mostly due to rapidly increasing option holdings. By 2000-05, the median large-firm executive holds stock options worth \$7.2million, significantly larger than her stock holdings of \$5 million, and almost 30 times her option holdings in 1970-79 (columns 3 and 4 of Table 2).

Figure 3 zooms in on the evolution of median CEO incentives in S&P 500 firms from 1992 to 2005. Consistent with the long-run evidence, the value of equity-at-stake for a typical CEO increases almost four-fold, from \$72,000 per 1% increase in firm value in 1992 to \$284,000 in 2005. The Jensen-Murphy fractional ownership statistic increases as well, albeit at a slower pace: in 1992, a typical S&P 500 CEO receives about \$1.10 for a \$1,000 increase in firm value; by 2005, her gain would be almost \$2.40.

To summarize, executives' monetary gains from a typical improvement in firm value were sizeable for most of the twentieth century and increased rapidly in the last three decades. On the other hand, executives' fractional equity ownership has always been low, and is even lower today than in the 1930s, raising serious concerns about moral hazard (Jensen & Murphy 1990a, Bebchuk & Fried 2004). Because of these conflicting signals about executives' incentives, we examine the merits of the different incentive measures in more detail next.

## **2.2 What is the right measure of the wealth-performance relationship?**

The "right" measure of CEO incentives has been the subject of a long debate in the academic literature.<sup>8</sup> The two most popular alternatives, the Jensen-Murphy fractional ownership statistic

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<sup>7</sup> Controlling for firm size leads to an increasing pattern in both incentive measures over time (Hadlock & Lumer 1997, Frydman & Saks 2010).

<sup>8</sup> See, among others, Jensen & Murphy (1990a), Joskow & Rose (1994), Garen (1994), Hall & Liebman (1998), Murphy (1999), Baker & Hall (2004), and Edmans et al. (2009). Measuring incentives as the sensitivity of wealth to performance is problematic for risk-averse CEOs. Options tend to pay off in states in which marginal utility is already low, which means that the actual incentives created for a given sensitivity are much smaller for options than for stock (Jenter 2002).

and the equity-at-stake statistic, disagree on the level of incentives and the evolution of incentives over time. CEOs' fractional ownership stakes are almost always small, particularly in large firms, suggesting that CEOs have trivial incentives. At the same time, many CEOs have millions of dollars invested in their firm's equity, causing large swings in their wealth for a typical change in firm value.

In recent theoretical work, Baker & Hall (2004) show that the correct measure of incentives depends on how CEO behavior affects firm value. In a modified agency model that allows the marginal product of CEO actions to vary with the value (or size) of the firm, the level of CEO incentives depends on the type of CEO activity considered. The Jensen-Murphy statistic is the right measure of incentives for activities whose dollar impact is the same regardless of the size of the firm, such as acquiring a corporate jet. Conversely, the value of equity-at-stake is the right measure of incentives for actions whose effect scales with firm size, such as a corporate reorganization. Since CEOs engage in both types of activities, both measures of incentives are important and should be looked at independently.<sup>9</sup>

Building on this insight, Edmans et al. (2009) calibrate a model in which CEO effort has a multiplicative effect on both the CEO's utility and on firm value. In their model, equity-linked compensation does well at inducing optimal CEO effort (because the effect of effort scales with firm size), but is ineffective in deterring rent extraction through actions that subtract linearly from firm value. In other words, incentive pay motivates CEOs to optimally reorganize the firm, but does not deter them from wasting money on corporate jets.

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<sup>9</sup> A third incentive measure is the elasticity of CEO wealth to performance (i.e., the percentage change in wealth for a one-percent improvement in firm value). This statistic has the attractive feature of not being sensitive to changes in firm size (Murphy 1985, Rosen 1992, Edmans et al. 2009). With CEOs' non-firm wealth unobservable, the elasticity has the disadvantage of being mechanically close to one when only considering the revaluations in stock and stock option holdings as sources of change in CEO wealth. In the extreme, this measure is zero for an executive with no equity holdings, and equal to one (or the option delta) if the executive holds at least one share (one option). In practice, researchers resort to approximations to this elasticity by scaling the absolute change in wealth by annual pay (Edmans et al. 2009) or by the sum of pay and the equity portfolio held (Hall & Liebman 1998, Frydman & Saks 2010).

### 2.3 Are incentives set optimally?

Determining whether observed compensation contracts optimally address the moral hazard problem between shareholders and CEOs is difficult.<sup>10</sup> The optimal incentive strength depends on parameters that are unobservable, such as the marginal product of CEO effort, the CEO's risk aversion, the CEO's cost of effort, and the CEO's outside wealth. These free variables make it easy to develop versions of the principal-agent model that are consistent with a wide range of empirical patterns. For example, Garen (1994) and Haubrich (1994) show that the low fractional ownership stakes lamented by Jensen & Murphy (1990a) are consistent with optimal contracting if CEOs are sufficiently risk averse. Given the flexibility of the agency model, most empirical studies focus instead on testing predictions about cross-sectional determinants of CEO incentives or the model's comparative statics.

In the basic principal-agent model, the optimal level of incentives declines with the cost of managerial effort, the noise-to-signal ratio of the performance measure, and the executive's risk aversion. Consistent with these comparative statics, the variation in CEO incentives across firms appears to be partly explained by the variance in stock returns, arguably a proxy for the noise in the outcome measure (Garen 1994, Aggarwal & Samwick 1999a, Himmelberg et al. 1999, Jin 2002, Garvey & Milbourn 2003).<sup>11</sup> Also, wealthier CEOs, who are likely to be less risk averse, have higher-powered incentives (Garen 1994, Becker 2006).

Empirical evidence on other predicted determinants of CEO incentives is inconclusive. Lambert & Larcker (1987) argue that compensation should be more closely tied to stock prices when accounting performance is relatively noisier. Even though there is consistent evidence for salaries and bonuses (Lambert & Larcker 1987) and option pay (Yermack 1995, Bryan et al. 2000), Core, Guay & Verrecchia (2003) find the opposite result for total CEO compensation. Gibbons & Murphy (1992) predict that incentives should be strongest for CEOs close to retirement to substitute for declining career concerns, and find consistent evidence for cash compensation. Yermack (1995) and Bryan et al. (2000), on the other hand, find no evidence that CEOs near retirement receive or

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<sup>10</sup> The determination is made more difficult by the fact that executive pay may be linked to firm performance for other reasons, including sorting of executives (Lazear 2004) and efficient bargaining over profits (Blanchflower, Oswald, and Sanfey 1996).

<sup>11</sup> In contrast, Core & Guay (2002b) find a positive correlation between stock-price variance and pay-performance sensitivity, contrary to the predictions of the basic model.

hold more stock options. John & John (1993) predict a negative relation between executive incentives and leverage as firms try to avoid agency costs of debt, but Yermack (1995) finds no empirical relation between stock option grants and leverage. Finally, some studies report evidence consistent with the conjecture that incentives should be stronger in firms with greater growth opportunities (Smith & Watts 1992, Gaver & Gaver 1995), while others report a negative correlation between these two variables (Bizjak et al. 1993, Yermack 1995).

Finally, a central prediction of the principal-agent model is the use of relative performance evaluation for CEOs. Holmström (1982) and Diamond & Verrecchia (1982) argue that contracts should filter out any systematic (e.g., market or industry) components in measured performance, as executives cannot affect these components but suffer from bearing the associated risk. The evidence on firms effectively using relative performance evaluation is weak.<sup>12</sup> Since wealth-performance sensitivities are dominated by revaluations of (non-indexed) stock and option holdings, overall CEO wealth is strongly and seemingly unnecessarily affected by aggregate performance shocks. Several recent papers, however, have proposed theories that explain the lack of benchmarking as an efficient contracting outcome.<sup>13</sup>

## **2.4 Brief summary**

Since the seminal contribution of Jensen & Murphy (1990a), our understanding of the link between firm performance and CEO compensation has improved substantially. The long-run evidence shows that compensation arrangements have served to tie the wealth of managers to firm performance—and perhaps to align managers' with shareholders' interests—for most of the twentieth century. Much of the effect of performance on CEO wealth works through revaluations of stock and option holdings, rather than through changes in annual pay. The sensitivity of CEO wealth to performance experienced a large increase in the 1980s and 90s, mostly due to rapidly growing option portfolios. In contrast, the typical CEO's fractional equity ownership remains low, suggesting a continued need for direct monitoring by boards and investors.

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<sup>12</sup> See, among others, Murphy (1985), Coughlan & Schmidt (1985), Antle & Smith (1986), Gibbons & Murphy (1990), Janakiraman et al. (1992), Garen (1994), Aggarwal & Samwick (1999a,b), and Murphy (1999).

<sup>13</sup> Aggarwal & Samwick (1999b) and Himmelberg & Hubbard (2000) argue that benchmarking may not be optimal, and Jin (2002), Jenter (2002), and Garvey & Milbourn (2003) that it may be unnecessary.

### **Section 3: Explaining CEO compensation: Rent extraction or competitive pay?**

The rapid rise in CEO pay over the past 30 years has sparked a lively debate about the determinants of executive compensation. At one end of the spectrum, the high levels of CEO pay are seen as the result of executives' ability to set their own pay and extract rents from the firms they manage. At the other end of the spectrum, CEO pay is viewed as the efficient outcome of a labor market in which firms optimally compete for managerial talent. Many other explanations for the rise in CEO pay have emerged in recent years, and the debate is too extensive to do it justice in this review. Instead, we divide the theories into those that view rising compensation as a rent-extraction problem, and those that view it as the efficient outcome of a market mechanism. We briefly summarize the main theoretical arguments for these two views and then discuss the empirical evidence.

#### **3.1 Theoretical explanations for the rise in CEO pay**

The rent extraction view posits that weak corporate governance and acquiescent boards allow CEOs to (at least partly) determine their own pay, resulting in inefficiently high levels of compensation. This theory, summarized as the "managerial power hypothesis" by Bebchuk & Fried (2004), also predicts that much of the rent extraction occurs through forms of pay that are less observable or more difficult to value, such as stock options, perquisites, pensions, and severance pay. While this argument is intuitive, recent theoretical work explores how inefficient compensation can be sustained in market equilibrium. Kuhnert & Zwiebel (2009) model CEOs who set their own pay, with both observable and unobservable components, subject to the constraint that too much rent extraction will get them ousted. Rent extraction survives in equilibrium because firing is costly and because a replacement CEO can also extract rents. Others have explored how CEO compensation is determined if there are both firms with strong and weak governance in the economy. Acharya & Volpin (2010) show that firms with weak governance (and therefore higher compensation) impose a negative externality on better-governed firms through the competition for managers, inducing inefficiently high levels of pay in all firms.

In contrast to the managerial power hypothesis, a growing literature argues that the growth in CEO pay is the efficient result of increasing demand for CEO effort or scarce managerial talent. One set of theories in this vein attributes the rise in CEO pay to increasing firm sizes and scale

effects. If higher CEO talent is more valuable in larger firms, then larger firms should offer higher levels of pay, and an efficient labor market matches them with more able CEOs (Rosen 1981, 1982). Small increments in CEO talent can imply large increments in firm value and compensation due to the scale of operations under the CEO's control (Himmelberg & Hubbard 2000). Gabaix & Landier (2008) and Terviö (2008) develop this idea further by solving competitive and frictionless assignment models for CEOs under the assumption that managerial talent has a multiplicative effect on firm output. In this framework, and using specific assumptions about the distribution of CEO talent, Gabaix & Landier show that CEO pay should move one-for-one with changes in the size of the typical firm. Thus, they argue that the six-fold increase in average CEO pay between 1980 and 2003 can be fully explained by the six-fold increase in average market capitalization over that period.

A second set of theories proposes that changes in firms' characteristics, technologies, and product markets over the last 30 years have increased the effect of CEO effort and talent on firm value, and therefore also the optimal levels of incentives and pay. For example, an increase in firm size raises the optimal level of CEO effort, and thus incentives, if the marginal product of CEO effort increases with the size of firms (Himmelberg & Hubbard 2000, Baker & Hall 2004). Alternatively, the productivity of managerial effort and talent may have increased because of more intense competition due to deregulation or entry by foreign firms (Hubbard & Palia 1995, Cuñat & Guadalupe 2009a,b), because of improvements in the communications technologies used by managers (Garicano & Rossi-Hansberg 2006), or because of higher volatility in the business environment (Dow & Raposo 2005). Finally, moral hazard problems may be more severe in larger firms, resulting in stronger incentives for CEOs as firms grow (Gayle & Miller 2009). Independently of their cause, higher-powered incentives have to be accompanied by higher levels of expected pay to compensate managers for greater risk in their compensation.

A third market-based explanation for the growth in CEO pay is a shift in the type of skills demanded by firms from firm-specific to general managerial skills. Such a shift intensifies the competition for talent, improves the outside options of executives, and allows managers to capture a larger fraction of their firms' rents (Murphy & Zábojník 2004, 2007, Frydman 2007). This theory predicts an increase in the level of CEO pay, rising inequality among executives within and across firms, and a higher fraction of CEOs hired from outside the firm.



Finally, a fourth market-based explanation proposes that the growth in CEO pay is the result of stricter corporate governance and improved monitoring of CEOs by boards and large shareholders. Hermalin (2005) shows that, if CEO job stability is negatively affected by an increase in monitoring intensity, firms optimally respond by increasing the level of CEO pay. According to this theory, the observed rise in pay should be accompanied by more CEO turnover, a stronger link between CEO turnover and firm performance, and more external CEO hires.

### **3.2 The empirical evidence**

Many of the aforementioned theories have been developed to explain the rise in CEO compensation and the use of equity-linked pay since the 1970s. It is therefore not surprising that many of them do a good job fitting some of the major stylized facts and cross-sectional patterns. However, as we argue this in section, these theories have trouble explaining CEO compensation in earlier decades, as well as recent cross-sectional patterns they were not designed to match.

#### **3.2.1 Evidence for and against the managerial power hypothesis**

The managerial power view of CEO compensation is supported by several pieces of anecdotal and systematic evidence. For example, the widespread use of “stealth” compensation is difficult to explain if compensation were simply the efficient outcome of an optimal contract. Even though perks, pensions, and severance pay can be part of optimal compensation, hiding these compensation elements from shareholders is suggestive of rent extraction (Bebchuk & Fried 2004, Kuhnen & Zwiebel 2009). Similarly, the widespread practice of executives hedging exposures to their own firm, again with minimal disclosure, is difficult to justify (Bettis et al. 2001). Rent-extraction is also suggested by the observation that CEOs are frequently rewarded for lucky events that are not under their control (such as an improving economy) but not equally penalized for unlucky events (Bertrand & Mullainathan 2001, Garvey & Milbourn 2006).<sup>14</sup> Finally, CEO pay increases following exogenous reductions in takeover threats (Bertrand & Mullainathan 1998) and declines following regulatory changes that strengthen board oversight (Chhaochharia & Grinstein 2009).

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<sup>14</sup> Jenter & Kanaan (2008) show that CEOs are more likely to be fired after bad industry or bad market performance, which indicates that some CEOs are penalized for bad luck.

Arguably the most persuasive evidence for the managerial power hypothesis is the revelation of widespread options backdating and spring loading. Yermack (1997) observes that stock prices tend to rise subsequent to option grants, suggesting that powerful CEOs are awarded options right before the release of positive news (so called “spring loading”). Recent evidence shows that spring loading alone is not sufficient to explain the stock price patterns around option grants. Instead, many grants must have had their “grant dates” chosen ex-post to minimize the strike price of at-the-money options and maximize their value to executives (Lie 2005, Heron & Lie 2007, Narayanan & Seyhun 2008). Such backdating of options appears to have been widespread, affecting about 30% of firms from 1996 to 2005 (Heron & Lie 2009), and was more prevalent in firms with weak boards and strong chief executives (Bebchuk et al. 2010).

A potent criticism of the managerial power hypothesis is that it is unable to explain the steady increase in CEO compensation since the 1970s. There is scant evidence that corporate governance has weakened over the last 30 years; instead, most indicators show that governance has considerably strengthened over this period (Holmström & Kaplan 2001, Hermalin 2005, Kaplan 2008). In defense of the managerial power hypothesis, it is possible that the desire or ability of managers to extract rents only emerged as social norms against unequal pay weakened. Piketty & Saez (2003) argue that such a shift in social norms helps explain the rise in CEO pay and the widening income inequality in the past three decades, and Levy & Temin (2007) relate this change in norms to the dismantling of institutions and government policies that prevented extreme pay outcomes from World War II to the 1970s. Alternatively, the increasing popularity of stock options, coupled with boards’ limited understanding of option valuation, may have allowed managers to camouflage their rent extraction as efficient incentive compensation (Hall & Murphy 2003, Bebchuk & Fried 2004).

### **3.2.2 Evidence for and against competitive pay**

Market-based and optimal contracting explanations for the rise in CEO pay have also received considerable empirical support. Notably, the stock market tends to react positively to announcements of compensation plans that introduce long-term incentive pay or link pay to stock prices (Larcker 1983, Morgan & Poulsen 2001). Consistent with a competitive labor market, CEOs of higher ability (identified through better performance) tend to receive higher compensation (Graham et al. 2009). Moreover, changes in product markets appear to have increased the

demand for managerial talent and raised CEO pay. Hubbard & Palia (1995) and Cuñat & Guadalupe (2009a) document higher pay levels and pay-performance sensitivities following industry deregulations, and Cuñat & Guadalupe (2009b) show that pay levels and incentives increase when firms face more import penetration. While these exogenous changes in the contracting environment have the predicted effects on managerial pay, the estimated magnitudes are modest, leaving a large fraction of the sharp rise in CEO pay unexplained.

The idea that firms' demand for CEO skill has shifted from firm-specific to general managerial human capital has the advantage of predicting not only an increase in compensation, but also changes in pay dispersion and managerial mobility that are consistent with the empirical evidence. As we saw in Section 1, the past three decades have seen a marked increase in the differences in executive pay between large and small firms, and between CEOs and other top executives. Over the same period, the ratio of new CEOs appointed from outside the firm has risen sharply, top executives have become more mobile across sectors, their business experiences have become more diverse, and the fraction of CEOs with an MBA has risen (Murphy & Zábojník 2007, Frydman 2007, Schoar 2008). However, these changes in managers' backgrounds and skills appear to have occurred slowly over time (Frydman 2007), and the magnitude and timing of the changes may not be large or quick enough to explain the rapid acceleration in CEO compensation since the 1980s.

The view that rising CEO pay is the result of stricter monitoring of CEOs by boards and large shareholders is also broadly consistent with the empirical evidence (Hermalin 2005). The fraction of outside directors on boards and the level of institutional stock ownership have increased since the 1970s (Huson et al. 2001), while CEO turnovers have become more frequent (Kaplan & Minton 2008) and closely linked to firm performance (Jenter & Lewellen 2010). While these trends are suggestive, there is no direct evidence that changes in governance caused the surge in CEO pay, or that added pressure on CEOs can account for the magnitude of the pay increase.

Finally, theories based on the interaction of firm scale with the demand for CEO talent find their strongest empirical support in the correlated increase in firm value and CEO pay since the 1970s. Gabaix & Landier (2008) calibrate their competitive model of CEO talent assignment and find that the growth in the size of the typical firm (measured by the market value of the median S&P 500

firm) can explain the entire growth in CEO compensation from 1980 to the present. However, this result and its interpretation have been criticized in several studies. First, the relationship between firm size and CEO pay appears highly sensitive to the time period chosen, as this correlation is weaker during the 1970s (Gordon & Dew-Becker 2008) and almost non-existent from the 1940s to the early 1970s (Frydman & Saks 2010). Moreover, even the post-1970s relationship may not be robust to different definitions of firm size (Gordon & Dew-Becker 2008) and different sample selection choices (Nagel 2010). Finally, since both the size of the typical firm and CEO compensation have trended upwards since the 1970s, it is difficult to determine whether the relationship between these two variables is causal.

A second difficulty for models of frictionless CEO talent assignment is the empirical scarcity of CEOs moving between firms. The models of Gabaix & Landier (2008) and Terviö (2008) predict that, at any point in time, a more talented CEO should run a larger firm. As a result, any changes in the size-rank of firms should lead to CEOs switching firms. In reality, CEOs stay at one firm for several years and rarely move directly from one CEO position to the next. Although it is straightforward to augment a competitive assignment model with a fixed cost of CEO replacement, the fixed cost would need to exceed the effects of differences in CEO talent. A large fixed cost of CEO replacement creates large match-specific rents that a powerful CEO could capture, fundamentally changing the explanation for high levels of CEO pay to one related to managerial power (Bebchuk & Fried 2004, Kuhnen & Zwiebel 2009).

### **3.3 Brief summary**

Our reading of the evidence suggests that both managerial power and competitive market forces are important determinants of CEO pay, and that neither approach alone is fully consistent with the available evidence. On the one hand, several compensation practices, as well as specific cases of outrageous and highly publicized pay packages, indicate that (at least some) CEOs are able to extract rents from their firms. On the other hand, efficient contracting explanations are arguably more successful at explaining differences in pay practices across firms and at explaining the evolution of CEO pay since the 1970s. However, none of theories provide a fully convincing explanation for the apparent regime change in CEO compensation that occurred during the 1970s. While it is possible that a combination of the proposed explanations can explain the subsequent rise in CEO pay, the relative importance of the different theories remains an open question.

#### **Section 4: The effect of compensation on CEO behavior and firm value**

The debate about the nature of the pay-setting process and the recent financial crisis have created renewed interest in the effects of compensation on CEO behavior and firm performance. Most concerns about managerial pay would be alleviated if high levels of CEO pay and high wealth-performance sensitivities led to better performance and higher firm values. However, providing convincing evidence on the effects of executive pay is extraordinarily difficult.

The main problem with determining the effects of compensation is one of identification. Compensation arrangements are the endogenous outcome of a complex process involving the CEO, the compensation committee, the full board of directors, compensation consultants, and the managerial labor market. As a result, compensation arrangements are correlated with a plethora of observable and unobservable firm and CEO characteristics. This makes it extremely difficult to interpret any observed correlation between executive pay and firm outcomes as evidence of a causal relationship. For example, CEO pay and firm performance may be correlated because compensation affects performance, because firm performance affects pay, or because an unobserved firm or CEO characteristic affects both variables.

##### **4.1: The relation between CEO incentives and firm value**

The relation between managerial incentives and firm value is one of the fundamental issues in compensation research. Most studies focus on whether managerial *equity* incentives affect firm value, often measured as Tobin's Q. In a seminal study, Morck et al. (1988) document that firm value increases with managerial ownership if managers own between 0 and 5% of the firm's equity, decreases if managers own between 5 and 25%, and increases again (weakly) for holdings above 25%. One interpretation of their findings is that the initial positive effect reflects improving incentives, and the subsequent negative effect increasing managerial entrenchment. Using two larger cross-sections of firms, McConnell & Servaes (1990) find that firm value increases until the equity ownership by managers and directors exceeds 40 to 50% of shares outstanding.

Subsequent studies have examined how different aspects of executives' equity incentives relate to firm value, with mixed results. For example, Mehran (1995) finds that firm value is positively related to managers' fractional stock ownership and to the fraction of equity-based pay. Habib & Ljungqvist (2005) observe a positive association of firm value with CEO stock holdings, but a negative one with option holdings. Notably, many other studies fail to find any relationship between firm value and executives' equity stakes (e.g., Agrawal & Knoeber 1996, Himmelberg et al. 1999, Demsetz & Villalonga 2001).

Several studies try to use instrumental variables to address the endogeneity of managers' equity incentives (e.g., Hermalin & Weisbach 1991, Himmelberg et al. 1999, Palia 2001). However, as pointed out by Himmelberg et al., valid instruments for managerial ownership are extremely difficult to obtain, because all known determinants of ownership are also likely determinants of Tobin's Q.<sup>15</sup> Because of the lack of credible instruments, the literature has so far been unable to convincingly identify the causal effects of managerial incentives on firm value.

#### **4.2 The relation between CEO incentives and firm behavior**

Incentive compensation should motivate managers to make sound business decisions that increase shareholder value. To assess whether existing compensation arrangements achieve this goal, a large literature studies the relationship between executive compensation and companies' investment and financial policies.

Many of the early studies in this literature focus on accounting-based long-term incentive plans. The introduction of such incentive plans has been linked to, among others, increases in capital investment (Larcker 1983) and improvements in profitability (Kumar & Sopariwala 1992). More recent studies shift their focus to the effects of managers' stock and option holdings. Equity incentives have been connected to a wide variety of outcomes, including better operating performance (Core & Larcker 2002), more and better acquisitions (Datta et al. 2001, Cai & Vijn 2007), larger restructurings and layoffs (Dial & Murphy 1995, Brookman et al. 2007), and more voluntary liquidations (Mehran et al. 1998). Executive stock options, which are usually not dividend-protected, have also been linked to lower dividends (Lambert et al. 1989) and to a shift

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<sup>15</sup> Some papers try to account for the endogeneity of managerial ownership by estimating a simultaneous equation system. However, this approach requires at least as many exogenous variables as endogenous variables in the model. Thus, the challenges in finding valid instruments also apply to this methodology.

from dividends to share repurchases (Fenn & Liang 2001). Finally, a sizeable literature studies the relationship between managerial incentives and corporate risk-taking. The results suggest that stronger equity incentives are associated with less risk taking, while convexity in executives' portfolios due to options is correlated with more risk taking.<sup>16</sup>

### **4.3 Incentive compensation and manipulation**

Any form of incentive compensation entails the danger that managers may manipulate the performance measure.<sup>17</sup> Consistent with this prediction, several studies link earnings-based bonus plans to earnings management, especially if realized earnings are close to floors and caps in the bonus schedule (Healy 1985, Holthausen et al. 1995). Firms also seem to manipulate the disclosure of information around CEO option awards, delaying the release of good news and accelerating the disclosure of bad news (Aboody & Kasznik 2000). Finally, a series of recent studies document a positive correlation between CEOs' equity incentives and earnings manipulation (Cheng & Warfield 2005, Bergstresser & Philippon 2006, Burns & Kedia 2006, Efendi et al. 2007, Peng & Röell 2008). However, there is disagreement about which part of CEOs' equity incentives is the culprit, with some studies linking manipulation to option (but not stock) incentives, and others linking manipulation to stock holdings (but not options). Moreover, the evidence for a connection between equity incentives and accounting irregularities is not unanimous. Erickson et al. (2006) find that executives' equity incentives are unrelated to accusations of accounting fraud by the SEC, while Armstrong et al. (2009) show that CEO equity incentives have, if anything, a modestly *negative* effect on three types of accounting irregularities (restatements, SEC enforcement releases, and class action lawsuits).

### **4.4 Brief summary**

The literature provides ample evidence that CEO compensation and portfolio incentives are correlated with a wide variety of corporate behaviors, from investment and financial policies to risk taking and manipulation. Arguably, the widespread use of incentive compensation and the large cross-sectional differences in managerial contracts would make little sense if compensation had no effect on CEO behavior. However, because compensation arrangements are endogenous and correlated with many unobservables, measuring their causal effects on behavior and firm

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<sup>16</sup> See, for example, Tufano (1996), Guay (1999), Rajgopal & Shevlin (2002), and Coles et al. (2006).

<sup>17</sup> See Bolton et al. (2006) and Benmelech et al. (2010) for models of performance manipulation.

value is extremely difficult and remains one of the most important challenges for research on executive pay.

## **Conclusion**

The executive compensation literature has experienced tremendous growth in recent years, and so has our understanding of managerial pay practices. Yet, many questions remain unanswered. Notably, the causes of the apparent regime change in CEO compensation that occurred during the 1970s remain largely unknown. The relative importance of rent extraction and optimal contracting in determining pay for the typical CEO is still to be determined, and even less is known about the causal effects of CEO pay on behavior and firm value. Finding answers to these questions will likely require a combination of new theory predictions, the creative use of exogenous changes in the contracting environment, and new data from other countries, prior decades, and different types of firms. The progress made by recent studies on all these dimensions is cause for optimism and suggests that answers may not be far off.

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## Literature Cited

- Aboody D, Kasznik R. 2000. CEO stock option awards and the timing of corporate voluntary disclosures. *J. Acc. Econ.* 29(1):73-100
- Abowd JM, Kaplan DS. 1999. Executive compensation: six questions that need answering. *J. Econ. Perspect.* 13(4):145-68
- Acharya AV, Volpin PF. 2010. Corporate governance externalities. *Rev. Finance* 14(1):1-33
- Aggarwal RK, Samwick AA. 1999a. The other side of the tradeoff: the impact of risk on executive compensation. *J. Polit Econ.* 107(1):65-105
- Aggarwal RK, Samwick AA. 1999b. Executive compensation, relative performance evaluation, and strategic competition: theory and evidence. *J. Finance* 54(6):1999-2043
- Aggarwal RK. 2008. Executive compensation and incentives. In *Handbook of Corporate Finance: Empirical Corporate Finance*, ed. BE Eckbo, pp. 497-538. Amsterdam: Elsevier/North-Holland
- Agrawal A, Knoeber CR. 1996. Firm performance and mechanisms to control agency problems between managers and shareholders. *J. Financ. Quant. Anal.* 31(3):377-97
- Almazan A, Suarez J. 2003. Entrenchment and severance pay in optimal governance structures. *J. Finance* 58(2):519-47
- Antle R, Smith A. 1986. An empirical investigation of the relative performance evaluation of corporate executives. *J. Acc. Res.* 24(1):1-39
- Armstrong CS, Jagolinzer AD, Larcker DF. 2009. *Chief executive officer equity incentives and accounting irregularities*. Work. Pap., Stanford Univ.
- Baker GP. 1992. Incentive contracts and performance measurement. *J. Polit. Econ.* 100(3):598-614
- Baker GP, Hall BJ. 2004. CEO incentives and firm size. *J. Labor Econ.* 22(4):767-98
- Bebchuk LA, Fried JM. 2004. *Pay without Performance: The Unfulfilled Promise of Executive Compensation*. Cambridge, MA: Harvard Univ. Press
- Bebchuk LA, Grinstein Y. 2005. The growth of executive pay. *Oxford Rev. Econ. Pol.* 21(2):283-303
- Bebchuk LA, Grinstein Y, Peyer UC. 2010. Lucky CEOs and lucky directors. *J. Finance*. Forthcoming
- Bebchuk LA, Jackson RJ. 2005. Executive pensions. *J. Corp. L.* 30:823-56
- Becker B. 2006. Wealth, risk aversion and CEO compensation. *J. Finance* 61(1):379-97
- Benmelech E, Kandel G, Veronesi P. 2010. Stock-based compensation and CEO (dis)incentives. *Q. J. Econ.* Forthcoming
- Benston G. 1985. The self-serving management hypothesis: some evidence. *J. Acc. Econ.* 7(1-3):67-83
- Bergman NK, Jenter D. 2007. Employee sentiment and stock option compensation. *J. Financ. Econ.* 84(3):667-712
- Bergstresser D, Philippon T. 2006. CEO incentives and earnings management. *J. Financ. Econ.* 80(3):511-29
- Berle AA, Means GC. 1932. *The modern corporation and private property*. New York: Macmillan

- Bertrand M. 2009. CEOs. *Ann. Rev. Econ.* 1:121-49
- Bertrand M, Mullainathan S. 1998. *Executive compensation and incentives: the impact of takeover legislation*. Work. Pap., NBER
- Bertrand M, Mullainathan S. 2001. Are CEOs rewarded for luck? The ones without principals are. *Q. J. Econ.* 116(3):901-32
- Bettis JC, Bizjak JM, Lemmon ML. 2001. Managerial ownership, incentive contracting, and the use of zero-cost collars and equity swaps by corporate insiders. *J. Financ. Quant. Anal.* 36(3):345-70
- Bizjak JM, Brickley JA, Coles JL. 1993. Stock-based incentive compensation and investment behavior. *J. Acc. Econ.* 16(1-3):349-72
- Blanchflower DG, Oswald AJ, Sanfey P. Wages, profits, and rent-sharing. *Quart. J. Econ.* 111(1):227-51
- Bolton P, Scheinkman JA, Xiong W. 2006. Executive compensation and short-termist behavior in speculative markets. *Rev. Econ. Stud.* 73(3):577-610
- Brookman JT, Chang S, Rennie CG. 2007. CEO equity portfolio incentives and layoff decisions. *J. Financ. Res.* 30(2):259-81
- Bryan S, Hwang L, Lilien S. 2000. CEO stock-based compensation: an empirical analysis of incentive-intensity, relative mix, and economic determinants. *J. Bus.* 73(4):661-93
- Burns N, Kedia S. 2006. The impact of performance-based compensation on misreporting. *J. Financ. Econ.* 79(1):35-67
- Cai J, Vijh AM. 2007. Incentive effects of stock and option holdings of target and acquirer CEOs. *J. Finance* 62(4):1891-933
- Carpenter JN. 1998. The exercise and valuation of executive stock options. *J. Financ. Econ.* 48(2):127-58
- Carpenter JN, Stanton R, Wallace N. 2010. Optimal exercise of executive stock options and implications for firm cost. *J. Financ. Econ.* Forthcoming
- Cheng Q, Warfield T. 2005. Equity incentives and earnings management. *Acc. Rev.* 80(2):441-76
- Chhaochharia V, Grinstein Y. 2009. CEO compensation and board oversight. *J. Finance* 64(1):231-61
- Coles JL, Daniel ND, Naveen L. 2006. Managerial incentives and risk-taking. *J. Financ. Econ.* 79(2):431-68
- Core JE, Guay WR. 2002a. Estimating the value of employee stock option portfolios and their sensitivities to price and volatility. *J. Acc. Res.* 40(3):613-30
- Core JE, Guay WR. 2002b. *The other side of the trade-off: the impact of risk on executive compensation – a revised comment*. Work. Pap., Univ. Penn.
- Core JE, Guay WR, Larcker DF. 2003. Executive equity compensation and incentives: a survey. *Fed. Res. Bank New York Econ. Policy Rev.* 9(1):27-50
- Core JE, Guay WR, Verrecchia R. 2003. Price versus non-price performance measures in optimal CEO compensation contracts. *Acc. Rev.* 78(4):957-81

- Core JE, Larcker DF. 2002. Performance consequences of mandatory increases in executive stock ownership. *J. Financ. Econ.* 64(3):317-40
- Coughlan A, Schmidt R. 1985. Executive compensation, management turnover, and firm performance: an empirical investigation. *J. Acc. Econ.* 7(1-3):43-66
- Cuñat V, Guadalupe M. 2009a. Executive compensation and competition in the banking and financial sectors. *J. Bank. Finance* 33(3):495-504
- Cuñat V, Guadalupe M. 2009b. Globalization and the provision of incentives inside the firm: the effect of foreign competition. *J. Labor Econ.* 27(2):179-212
- Datta S, Iskandar-Datta M, Raman K. 2001. Executive compensation and corporate acquisition decisions. *J. Finance* 56(6):2299-336
- Demsetz H, Villalonga B. 2001. Ownership structure and corporate performance. *J. Corp. Finance* 7(3):209-33
- Dial J, Murphy KJ. 1995. Incentives, downsizing, and value creation at General Dynamics. *J. Financ. Econ.* 37(3):261-314
- Diamond DW, Verrecchia R. 1982. Optimal managerial contracts and equilibrium security prices. *J. Finance* 37(2):275-87
- Dow J, Raposo CC. 2005. CEO compensation, change, and corporate strategy. *J. Finance* 60(6):2701-27
- Edmans A, Gabaix X. 2009. Is CEO pay really inefficient? A survey of new optimal contracting theories. *Eur. Financ. Manag.* 15(3):486-96
- Edmans A, Gabaix X, Landier A. 2009. A multiplicative model of optimal CEO incentives in market equilibrium. *Rev. Financ. Stud.* 22(12):4881-917
- Edmans A, Liu Q. 2010. Inside debt. *Rev. Finance* Forthcoming
- Efendi J, Srivastava A, Swanson EP. 2007. Why do corporate managers misstate financial statements? The role of option compensation and other factors. *J. Financ. Econ.* 85(3):667-708
- Erickson M, Hanlon M, Maydew EL. 2006. Is there a link between executive equity incentives and accounting fraud? *J. Acc. Res.* 44(1):113-43
- Fama E. 1980. Agency problems and the theory of the firm. *J. Polit. Econ.* 88(2):288-307
- Fenn GW, Liang N. 2001. Corporate payout policy and managerial stock incentives. *J. Financ. Econ.* 60(1):45-72
- Finkelstein S, Hambrick D. 1996. *Strategic Leadership: Top Executives and Their Effects on Organizations*. Minneapolis: West
- Frydman C. 2007. *Rising through the ranks: the evolution of the market for corporate executives, 1936-2003*. Work. Pap., MIT
- Frydman C, Saks RE. 2010. Executive compensation: a new view from a long-term perspective, 1936-2005. *Rev. Financ. Stud.* Forthcoming
- Gabaix X, Landier A. 2008. Why has CEO pay increased so much? *Q. J. Econ.* 123(1):49-100
- Garen J. 1994. Executive compensation and principal-agent theory. *J. Polit Econ.* 102(6):1175-1199

- Garicano L, Rossi-Hansberg E. 2006. Organization and inequality in a knowledge economy. *Q. J. Econ.* 121(4):1383-435
- Garvey GT, Milbourn TT. 2003. Incentive compensation when executives can hedge the market: evidence of relative performance evaluation in the cross section. *J. Finance* 58(4):1557-81
- Garvey GT, Milbourn TT. 2006. Asymmetric benchmarking in compensation: executives are rewarded for good luck but not penalized for bad. *J. Financ. Econ.* 82(1):197-225
- Gaver JJ, Gaver KM. 1995. Compensation policy and the investment opportunity set. *Financ. Manag.* 24(1):19-32
- Gayle GL, Miller RA. 2009. Has moral hazard become a more important factor in managerial compensation? *Am. Econ. Rev.* 99(5):1740-69
- Gibbons R, Murphy KJ. 1990. Relative performance evaluation for chief executive officers. *Ind. Labor Relat. Rev.* 43(3):305-515
- Gibbons R, Murphy KJ. 1992. Optimal incentive contracts in the presence of career concerns: theory and evidence. *J. Polit. Econ.* 100(3):468-505.
- Gordon RJ, Dew-Becker IL. 2008. *Controversies about the rise of American inequality: a survey.* Work. Pap., Northwest. Univ.
- Graham JR, Li S, Qiu J. 2009. *Managerial attributes and executive compensation.* Work. Pap., Duke Univ.
- Grinstein Y, Weinbaum D, Yehuda N. 2009. *The economic consequences of perks disclosure.* Work. Pap., Cornell Univ.
- Guay WR. 1999. The sensitivity of CEO wealth to equity risk: an analysis of the magnitude and determinants. *J. Financ. Econ.* 53(1):43-71
- Habib MA, Ljungqvist A. 2005. Firm value and managerial incentives: a stochastic frontier approach. *J. Bus.* 78(6):2053-94
- Hadlock C, Lumer G. 1997. Compensation, turnover, and top management incentives: historical evidence. *J. Bus.* 70(2):153-87
- Hall B, Liebman J. 1998. Are CEOs really paid like bureaucrats? *Q. J. Econ.* 113(3):653-91
- Hall B, Murphy KJ. 2002. Stock options for undiversified executives. *J. of Acc. Econ.* 33(1):3-42.
- Hall B, Murphy KJ. 2003. The trouble with stock options. *J. Econ. Perspect.* 17(3):49-70
- Hartzell JC, Ofek E, Yermack, D. 2004. What's in it for me? Private benefits obtained by CEOs whose companies are acquired. *Rev. Financ. Stud.* 17(1):37-61.
- Haubrich JG. 1994. Risk aversion, performance pay, and the principal-agent problem. *J. Polit. Econ.* 102(2):258-76
- Healy P. 1985. The effect of bonus schemes on accounting decisions. *J. Acc. Econ.* 7(1-3):85-107
- Hermalin BE. 2005. Trends in corporate governance. *J. Finance* 60(5):2351-84
- Hermalin BE, Weisbach MS. 1991. The effects of board composition and direct incentives on firm performance. *Financ. Manag.* 20(4):101-12
- Heron RA, Lie E. 2007. Does backdating explain the stock price pattern around executive stock

- option grants? *J. Financ. Econ.* 83(2):271-95
- Heron RA, Lie E. 2009. What fraction of the stock option grants to top executives have been backdated or manipulated? *Manag. Sci.* 55(4):513-25
- Himmelberg CP, Hubbard RG. 2000. *Incentive pay and the market for CEOs: an analysis of pay-for-performance sensitivity.* Work. Pap., Columbia Univ.
- Himmelberg CP, Hubbard RG, Palia D. 1999. Understanding the determinants of managerial ownership and the link between ownership and performance. *J. Financ. Econ.* 53(3):353-84
- Holmström B. 1979. Moral hazard and observability. *Bell J. Econ.* 10(1):74-91
- Holmström B. 1982. Moral hazard in teams. *Bell J. Econ.* 13(2):324-40
- Holmström B, Kaplan SN. 2001. Corporate governance and merger activity in the United States: making sense of the 1980s and 1990s. *J. Econ. Perspect.* 15(2):121-44
- Holthausen RW, Larcker DF, Sloan RG. 1995. Annual bonus schemes and the manipulation of earnings. *J. Acc. Econ.* 19(1):29-74
- Hubbard RG, Palia D. 1995. Executive pay and performance: evidence from the US banking industry. *J. Financ. Econ.* 39(1):105-30
- Huson MR, Parrino R, Starks LT. 2001. Internal monitoring mechanisms and CEO turnover: a long-term perspective. *J. Finance* 56(6):2265-97
- Inderst R, Mueller HM. 2009. CEO replacement under private information. *Rev. Financ. Stud.* Forthcoming
- Ingersoll J. 2006. The subjective and objective evaluation of incentive stock options. *J. Bus.* 79(2):453-87
- Janakiraman S, Lambert RA, Larcker DF. 1992. An empirical investigation of the relative performance evaluation hypothesis. *J. Acc. Res.* 30(1):53-69
- Jensen MC. 1986. Agency costs of free cash flow, corporate finance, and takeovers. *Am. Econ. Rev.* 76(2):323-29
- Jensen MC, Meckling WH. 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. *J. Financ. Econ.* 3(4):305-60
- Jensen MC, Murphy KJ. 1990a. Performance pay and top management Incentives. *J. Polit. Econ.* 98(2):225-264
- Jensen MC, Murphy KJ. 1990b. CEO incentives: it's not how much, but how. *Harvard Bus. Rev.* 68(3):138-53
- Jenter D. 2002. *Executive compensation, incentives, and risk.* Work. Pap. MIT
- Jenter D, Kanaan F. 2008. *CEO turnover and relative performance evaluation.* Work. Pap., Stanford Univ.
- Jenter D, Lewellen K. 2010. *Performance-induced CEO turnover,* Work. Pap., Stanford Univ.
- Jin L. 2002. CEO compensation, diversification, and incentives. *J. Financ. Econ.* 66(1):29-63

- John T, John K. 1993. Top-management compensation and capital structure. *J. Finance* 48(3):949-74
- Joskow P, Rose N. 1994. *CEO pay and firm performance: dynamics, asymmetries, and alternative performance measures*. NBER Work. Pap. No. 4976
- Kaplan SN. 2008. Are U.S. CEOs overpaid? *Acad. Manag. Perspect.* 22(2):5-20
- Kaplan SN, Minton B. 2008. *How has CEO turnover changed? Increasingly performance sensitive boards and increasingly uneasy CEOs*. Work. Pap., Univ. Chic.
- Klein D, Maug E. 2009. *How do executives exercise their stock options?* Work. Pap., Univ. Mannheim
- Kuhnen CM, Zwiebel J. 2009. *Executive pay, hidden compensation and managerial entrenchment*. Work. Pap., Northwestern Univ.
- Kumar R, Sopariwala PR. 1992. The effect of adoption of long-term performance plans on stock prices and accounting numbers. *J. Financ. Quant. Anal.* 27(4):561-73
- Lambert RA, Lanen WN, Larcker DF. 1989. Executive stock option plans and corporate dividend policy. *J. Financ. Quant. Anal.* 24(4):409-25
- Lambert RA, Larcker DF. 1985. Golden Parachutes, executive decision-making, and shareholder wealth. *J. Acc. Econ.* 7(1-3):179-203
- Lambert RA, Larcker DF. 1987. An analysis of the use of accounting and market measures of performance in executive compensation contracts. *J. Acc. Res.* 25:85-125
- Lambert RA, Larcker DF, Verrecchia RE. 1991. Portfolio considerations in valuing executive compensation. *J. Acc. Res.* 29(1):129-49
- Larcker DF. 1983. The association between performance plan adoption and corporate capital investment. *J. Acc. Econ.* 5(1):3-30
- Lazear EP. 2004. Output-based pay: incentives or sorting? In *Research in Labor Economics, 23, Accounting For Worker Well-Being*, ed. SW Polachek, pp. 1-25. Oxford: JAI/Elsevier
- Levy FS, Temin P. 2007. *Inequality and institutions in 20th century America*. Work. Pap., MIT
- Lewellen W, Huntsman B. 1970. Managerial pay and corporate performance. *Am. Econ. Rev.* 60(4):710-20
- Lie E. 2005. On the timing of CEO stock option awards. *Manag. Sci.* 51(5):802-12
- McConnell JJ, Servaes H. 1990. Additional evidence on equity ownership and corporate value. *J. Financ. Econ.* 27(2):595-612
- Mehran H. 1995. Executive compensation structure, ownership, and firm performance. *J. Financ. Econ.* 38(2):163-84
- Mehran H, Nogler GE, Schwartz KB. 1998. CEO incentive plans and corporate liquidation policy. *J. Financ. Econ.* 50(3):319-49
- Meulbroek L. 2001. The efficiency of equity-linked compensation: understanding the full cost of awarding stock options. *Financ. Manag.* 30(2):5-30
- Morck R, Shleifer A, Vishny RW. 1988. Management ownership and market valuation: an empirical analysis. *J. Financ. Econ.* 20(1-2):293-315

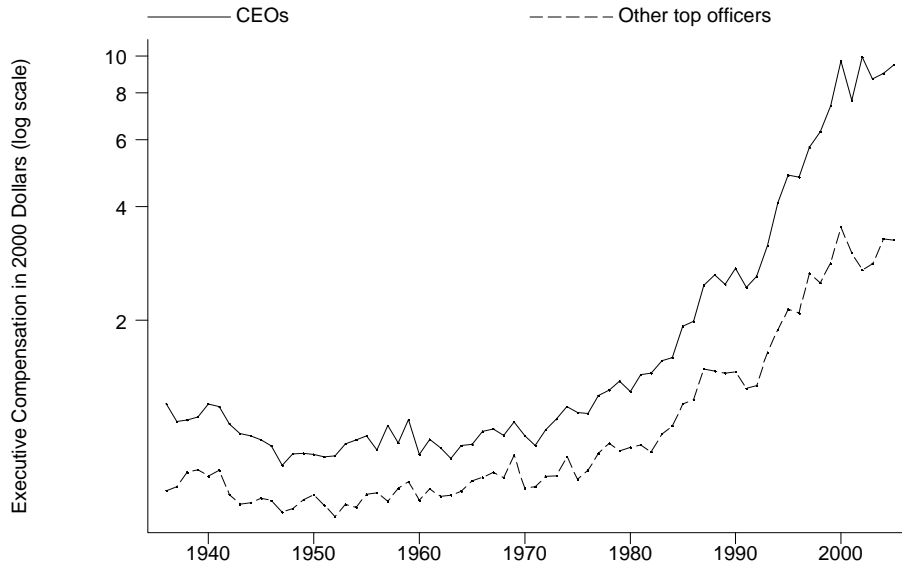
- Morck R, Shleifer A, Vishny RW. 1990. Do managerial objectives drive bad acquisitions? *J. Finance* 45(1):31-48
- Morgan AG, Poulsen AB. 2001. Linking pay to performance—compensation proposals in the S&P 500. *J. Financ. Econ.* 62(3):489-523
- Murphy KJ. 1985. Corporate performance and managerial remuneration: an empirical analysis. *J. Acc. Econ.* 7(1-3):11-42
- Murphy KJ. 1999. Executive compensation. In *Handbook of Labor Economics Vol.3B*, ed. O Ashenfelter, D Card, pp. 2485-563. Amsterdam: Elsevier/North-Holland
- Murphy KJ, Zábojník J. 2004. CEO pay and appointments: a market-based explanation for recent trends. *Am. Econ. Rev.* 94(2):192-96
- Murphy KJ, Zábojník J. 2007. *Managerial capital and the market for CEOs*. Work. Pap., Univ. South. Cal.
- Nagel GL. 2010. The effect of labor market demand on U.S. CEO pay since 1980. *Financ. Rev.* Forthcoming
- Narayanan MP, Seyhun HN. 2008. The dating game: do managers designate option grant dates to increase their compensation? *Rev. Financ. Stud.* 21(5):1907-45
- Palia D. 2001. The endogeneity of managerial compensation in firm valuation: a solution. *Rev. Financ. Stud.* 14(3):735-64
- Peng L, Röell A. 2008. Executive pay and shareholder litigation. *Rev. Finance* 12(1):141-84
- Piketty T, Saez E. 2003. Income inequality in the United States, 1913-1998. *Q. J. Econ.* 118(1):1-39
- Rajan RG, Wulf J. 2006. Are perks purely managerial excess? *J. Financ. Econ.* 79(1):1-33
- Rajgopal S, Shevlin T. 2002. Empirical evidence on the relation between stock option compensation and risk taking. *J. Acc. Econ.* 33(2):145-71
- Roberts DR. 1956. A general theory of executive compensation based on statistically tested propositions. *Quart. J. Econ.* 70(2):270-94
- Rosen S. 1981. The economics of superstars. *Am. Econ. Rev.* 71(5):845-58
- Rosen S. 1982. Authority, control, and the distribution of earnings. *Bell J. Econ.* 13(2):311-23
- Rosen S. 1992. Contracts and the market for executives. In *Contract Economics*, ed. L Wein, H Wijkander. Cambridge: Blackwell Publishers
- Rusticus TO. 2006. *Executive severance agreements*. Work. Pap., Univ. Penn.
- Schaefer S. 1998. The dependence of pay-performance sensitivity on the size of the firm. *Rev. Econ. Stat.* 80(3):436-43
- Schoar A. 2008. *CEO careers and style*. Work. Pap., MIT
- Smith CW, Watts RL. 1992. The investment opportunity set and corporate financing, dividend and compensation policies. *J. Financ. Econ.* 32(3):263-92
- Sundaram RK, Yermack DL. 2007. Pay me later: inside debt and its role in managerial compensation. *J. Finance* 62(4):1551-88

- Terviö M. 2008. The difference that CEOs make: an assignment model approach. *Am. Econ. Rev.* 98(3):642–68
- Tufano P. 1996. Who manages risk? An empirical examination of risk management practices in the gold mining industry. *J. Finance* 51(4):1097-137
- Yermack D. 1995. Do corporations award CEO stock options effectively? *J. Financ. Econ.* 39(2-3):237-69
- Yermack D. 1997. Good timing: CEO stock option awards and company news announcements. *J. Finance* 52(2):449-76
- Yermack D. 2006a. Flights of fancy: corporate jets, CEO perquisites, and inferior shareholder returns. *J. Financ. Econ.* 80(1):211-42
- Yermack D. 2006b. Golden handshakes: separation pay for retired and dismissed CEOs. *J. Acc. Econ.* 41(3):237-56



**Figure 1: Median Compensation of CEOs and Other Top Officers from 1936 to 2005**

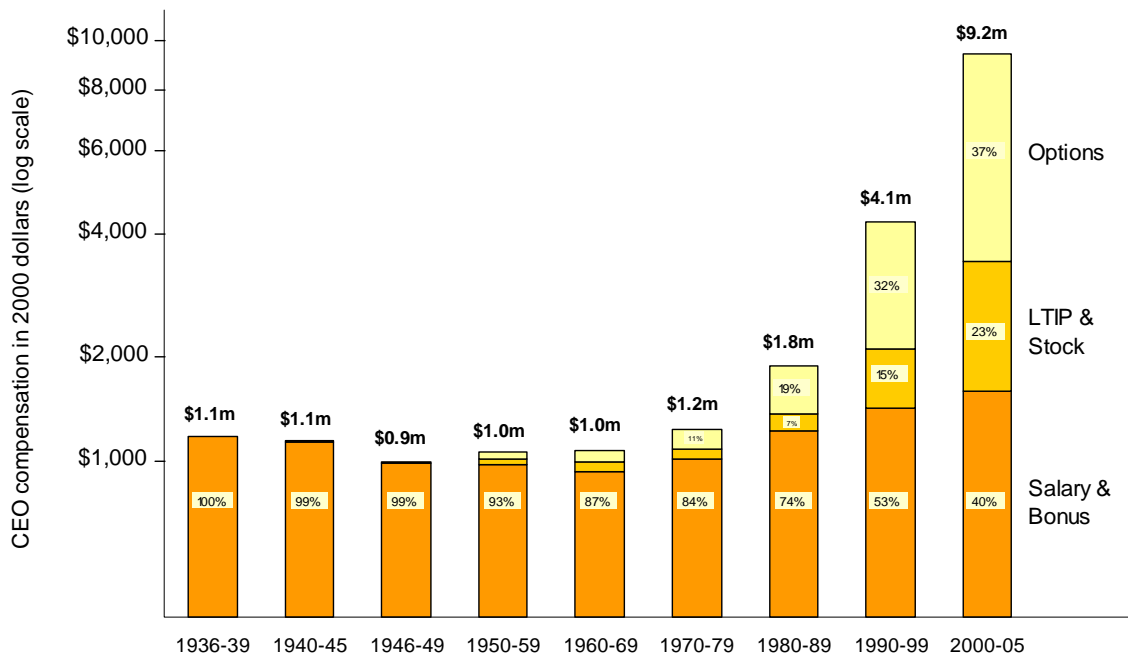
Figure 1 shows the median level of compensation in a sample of the three highest-paid officers in the largest 50 firms in 1940, 1960 and 1990 (for a total of 101 firms). Firms are selected according to total sales in 1960 and 1990, and according to market value in 1940. Compensation data is hand-collected for all available years from 1936 to 1992; the S&P ExecuComp database is used to extend the data to 2005 (Frydman & Saks 2010). Total compensation is composed of salary, bonuses, long-term bonus payments (including grants of restricted stock), and stock option grants (valued using Black-Scholes). The CEO is identified as the president of the company in firms where the “CEO” title is not used. “Other top officers” include any executives among the 3 highest-paid who are not the CEO. All dollar values are in inflation-adjusted 2000 dollars.



**Figure 2: The Structure of CEO Compensation**

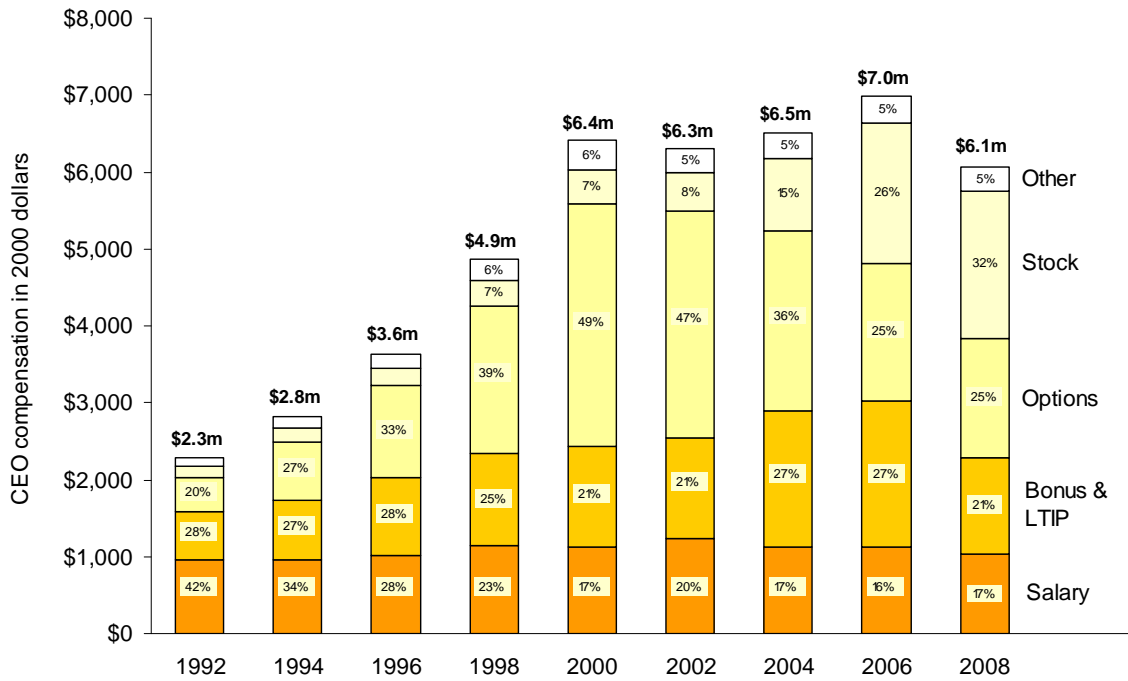
**Panel A: The structure of CEO compensation from 1936 to 2005**

The diagram shows the median level and the average composition of CEO pay in the 50 largest firms in 1940, 1960, and 1990 (for a total of 101 firms). Compensation data is hand-collected from proxy statements for all available years from 1936 to 1992; the S&P ExecuComp database is used to extend the data to 2005 (Frydman & Saks 2010). The figure depicts total compensation and the three main components that can be separately tracked over the sample period: salaries and current bonuses, payouts from long-term incentive plans (including the value of restricted stock), and the grant-date values of option grants (calculated using Black-Scholes). The component percentages are calculated by computing the percentages for average CEO pay in each period and then applying them to median CEO pay, as in Murphy (1999). All dollar values are in inflation-adjusted 2000 dollars. Note that the vertical axis is on a log scale.



**Panel B: The structure of CEO compensation from 1992 to 2008**

The diagram shows the median level and the average composition of CEO pay in S&P 500 firms from 1992 to 2008 and is based on ExecuComp data. ExecuComp collects compensation data from proxy statements for firms in the S&P 500, the S&P MidCap 500, and the S&P SmallCap 600. The figure depicts total compensation and its main components: salaries, bonuses and payouts from long-term incentive plans, the grant-date values of option grants (calculated using Black-Scholes), the grant-date values of restricted stock grants, and miscellaneous other compensation (perquisites, contributions to benefit plans, discounts on stock purchases, etc.). The component percentages are calculated by computing the percentages for average CEO pay in each period and then applying them to median CEO pay. All dollar values are in inflation-adjusted 2000 dollars. This figure is an expanded version of Figure 2 in Murphy (1999).



**Figure 3: CEO Incentives in S&P 500 Firms from 1992 to 2005**

The diagram shows the median equity incentives of CEOs in S&P 500 firms from 1992 to 2005 and is based on ExecuComp data. The Jensen-Murphy Statistic is the dollar change in executive wealth for a \$1,000 change in firm value, and is calculated as the executive’s fractional equity ownership ((number of shares held + number of options held \* average option delta) / (number of shares outstanding)) multiplied by \$1,000. Option deltas and holdings are computed using the Core & Guay (2002a) approximation as implemented by Edmans et al. (2009). Equity-at-Stake is the dollar change in executive wealth for a 1% change in firm value, and is the product of the executive’s fractional equity ownership (defined as in the Jensen-Murphy statistic) and the firm’s equity market capitalization. All dollar values are in inflation-adjusted 2000 dollars.



**Table 1: Executive Compensation Levels from 1992 to 2008**

The two panels show the median (Panel A) and mean (Panel B) annual pay for CEOs and non-CEO top executives from 1992 to 2008 in S&P 500, S&P MidCap 400, and S&P SmallCap 600 firms. The panels are based on ExecuComp data and include the CEO and the three highest-paid executives for each firm-year. Annual compensation is the sum of salaries, bonuses, payouts from long-term incentive plans, the grant-date values of option grants (calculated using Black-Scholes), the grant-date values of restricted stock grants, and miscellaneous other compensation. All dollar values are in inflation-adjusted 2000 dollars. Non-CEOs include any executives among the three highest-paid who are not the CEO.

**Panel A: Median compensation levels from 1992 to 2008 (\$ millions)**

Year	S&P 500		MidCap 400		SmallCap 600	
	CEO	Non-CEOs	CEO	Non-CEOs	CEO	Non-CEOs
1992	2.3	1.2	—	—	—	—
1993	2.2	1.2	—	—	—	—
1994	2.8	1.4	1.4	0.8	0.9	0.5
1995	3.1	1.5	1.4	0.8	0.9	0.5
1996	3.6	1.8	1.7	0.9	1.0	0.6
1997	4.2	2.1	2.2	1.1	1.2	0.7
1998	4.9	2.4	2.2	1.2	1.3	0.7
1999	5.8	2.8	2.4	1.3	1.3	0.7
2000	6.4	3.2	2.6	1.4	1.4	0.8
2001	7.2	3.2	2.5	1.3	1.4	0.7
2002	6.3	2.7	2.8	1.3	1.3	0.7
2003	6.2	2.7	2.5	1.2	1.4	0.7
2004	6.5	2.9	2.9	1.2	1.6	0.8
2005	6.3	2.8	2.9	1.3	1.7	0.8
2006	7.0	3.0	2.9	1.3	1.5	0.8
2007	6.9	3.1	3.3	1.4	1.5	0.7
2008	6.1	2.7	3.0	1.3	1.4	0.7

**Panel B: Average compensation levels from 1992 to 2008 (\$ millions)**

Year	S&P 500		MidCap 400		SmallCap 600	
	CEO	Non-CEOs	CEO	Non-CEOs	CEO	Non-CEOs
1992	3.0	1.6	—	—	—	—
1993	3.2	1.9	—	—	—	—
1994	3.9	2.0	2.2	1.3	1.4	0.8
1995	4.3	2.3	2.4	1.3	1.3	0.8
1996	6.2	2.9	3.0	1.6	1.6	0.9
1997	7.6	4.0	3.6	1.8	1.9	1.1
1998	9.6	4.7	4.0	1.8	2.0	1.1
1999	10.6	5.6	4.6	2.2	2.0	1.1
2000	14.6	7.3	4.4	2.4	2.2	1.2
2001	12.3	6.0	4.2	1.9	2.2	1.1
2002	9.1	4.5	3.9	1.9	2.0	1.0
2003	8.3	3.9	3.5	1.6	1.9	1.0
2004	8.9	4.2	4.0	1.8	2.2	1.1
2005	8.9	4.2	4.1	1.8	2.5	1.2
2006	9.5	4.7	3.9	1.7	2.0	1.0
2007	8.9	4.6	3.9	1.8	2.1	1.1
2008	8.2	3.9	3.6	1.7	2.0	1.0

**Table 2: Managerial Incentives and Equity Holdings from 1936 to 2005**

Based on the three-highest paid executives in the 50 largest firms in 1940, 1960, and 1990. Firms are selected according to total sales in 1960 and 1990, and according to market value in 1940. Compensation data is hand-collected from proxy statements for all available years from 1936 to 1992; the S&P ExecuComp database is used to extend the data to 2005 (Frydman & Saks 2010). Each column shows the median across all executives in each decade. The Jensen-Murphy Statistic is the dollar change in executive wealth for a \$1,000 change in firm value, and is calculated as the executive's fractional equity ownership ((number of shares held + number of options held \* average option delta) / (number of shares outstanding)) multiplied by \$1,000. Option deltas are computed using the Core & Guay (2002a) approximation. Equity-at-Stake is the dollar change in executive wealth for a 1% change in firm value, and is the product of the executive's fractional equity ownership (defined as in the Jensen-Murphy statistic) and the firm's equity market capitalization. The Value of Stock Holdings is the number of shares owned at the beginning of the year multiplied by the stock price. The Value of Option Holdings is the Black-Scholes value of stock options held at the beginning of the year. All dollar values are in inflation-adjusted 2000 dollars.

	Managerial incentives ( from stock & option holdings)		Dollar value of equity held	
	Jensen-Murphy statistic (dollar gain for \$1000 increase in firm value) (1)	Value of equity-at-stake (dollar gain for 1% increase in firm value) (2)	Value of stock holdings (\$) (3)	Value of option holdings (\$) (4)
1936-40	1.350	18,670	1,566,287	0
1941-49	0.399	6,814	679,429	0
1950-59	0.452	13,975	1,169,857	0
1960-69	0.675	38,978	2,333,663	212,150
1970-79	0.470	21,743	1,281,266	244,082
1980-89	0.551	34,679	1,604,861	926,869
1990-99	0.946	120,342	4,068,013	3,622,806
2000-05	1.080	227,881	4,966,035	7,160,898