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CEO Compensation

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

Abstract

This paper surveys the recent literature on CEO compensation. The rapid rise in CEO pay over the past 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.

1. INTRODUCTION

Executive compensation is a complex and contentious subject. The high level of CEO pay in the United States 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 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 World War II 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 grew dramatically, differences in pay across managers and firms widened, and equity incentives tied 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. Although useful, demonstrating that a 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 renewed interest in theoretical work on CEO pay and the emergence of new data 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. However, declines in CEO compensation observed after new regulations 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, especially contributions made since the comprehensive 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 et al. (2003), Aggarwal (2008), Bertrand (2009), and Edmans & Gabaix (2009).

The paper is organized as follows: Section 2 describes the evidence on the level and structure of CEO compensation. Section 3 examines the relationship between CEO pay and firm performance and discusses the merits of different pay-for-performance measures. Section 4 summarizes and critiques explanations for the rise in CEO pay. Section 5 discusses the effects of CEO pay on firm behavior and value. Section 6 presents our conclusions.

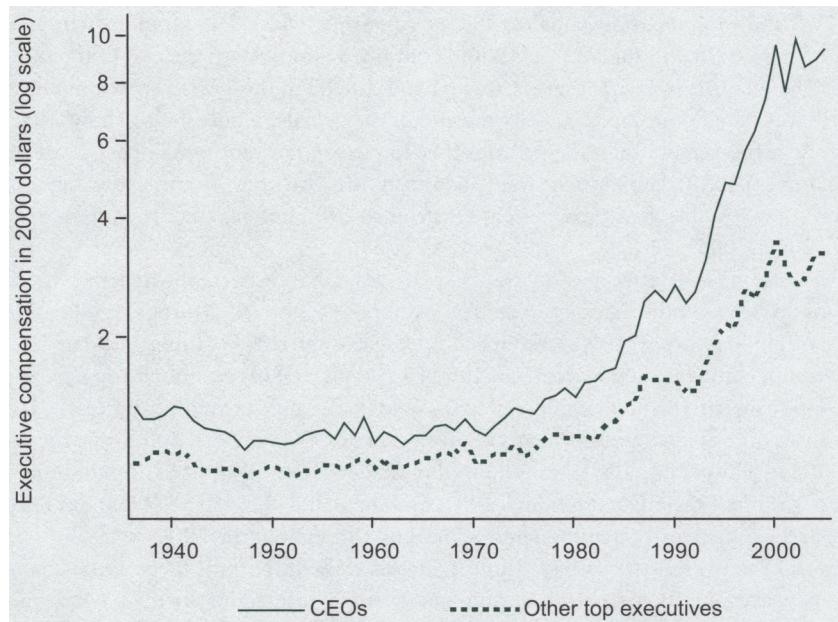


Figure 1

Median compensation of CEOs and other top officers from 1936 to 2005. Shows the median level of total 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 three highest-paid who are not the CEO. All dollar values are in inflation-adjusted 2000 dollars.

2. THE LEVEL AND STRUCTURE OF CEO COMPENSATION

2.1. The Level of CEO Compensation

The increase in CEO pay over the past 30 years, particularly its rapid acceleration in the 1990s, has been widely documented and analyzed. Using data from Frydman & Saks (2010), Figure 1 provides a longer-run perspective on the evolution of annual compensation for the three highest-paid executives in large U.S. firms from 1936 to 2005. Total annual compensation is measured as the sum of the executive’s salary, current bonuses and payouts from long-term incentive plans (paid in cash or in stock), and the Black-Scholes value of stock option grants.¹

Figure 1 reveals a J-shaped pattern in executive compensation 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

¹Black-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).

mid-1970s (averaging approximately 0.8% growth per year). The rapid growth in executive pay only started in the mid-1970s and continued almost until the end of the sample in 2005. The increase in compensation was most dramatic in the 1990s, with annual growth rates that reached more than 10% by the end of the decade. **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 approximately 1.4 prior to 1980 but has since then risen to almost 2.6 by 2000–2005.

The surge in executive pay in the past 30 years has been replicated in larger cross sections by many other studies (see, for example, Jensen & Murphy 1990b, Hall & Liebman 1998, Murphy 1999, and Bebchuk & Grinstein 2005). **Table 1** zooms in on the evolution of 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 increased for firms of all sizes. For CEOs of S&P 500 firms, the median level of pay climbed rapidly from \$2.3 million in 1992 to a peak of \$7.2 million 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 \$6 million and \$7 million throughout the 2000s.

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

Table 1 Executive compensation levels from 1992 to 2008*

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

(Continued)

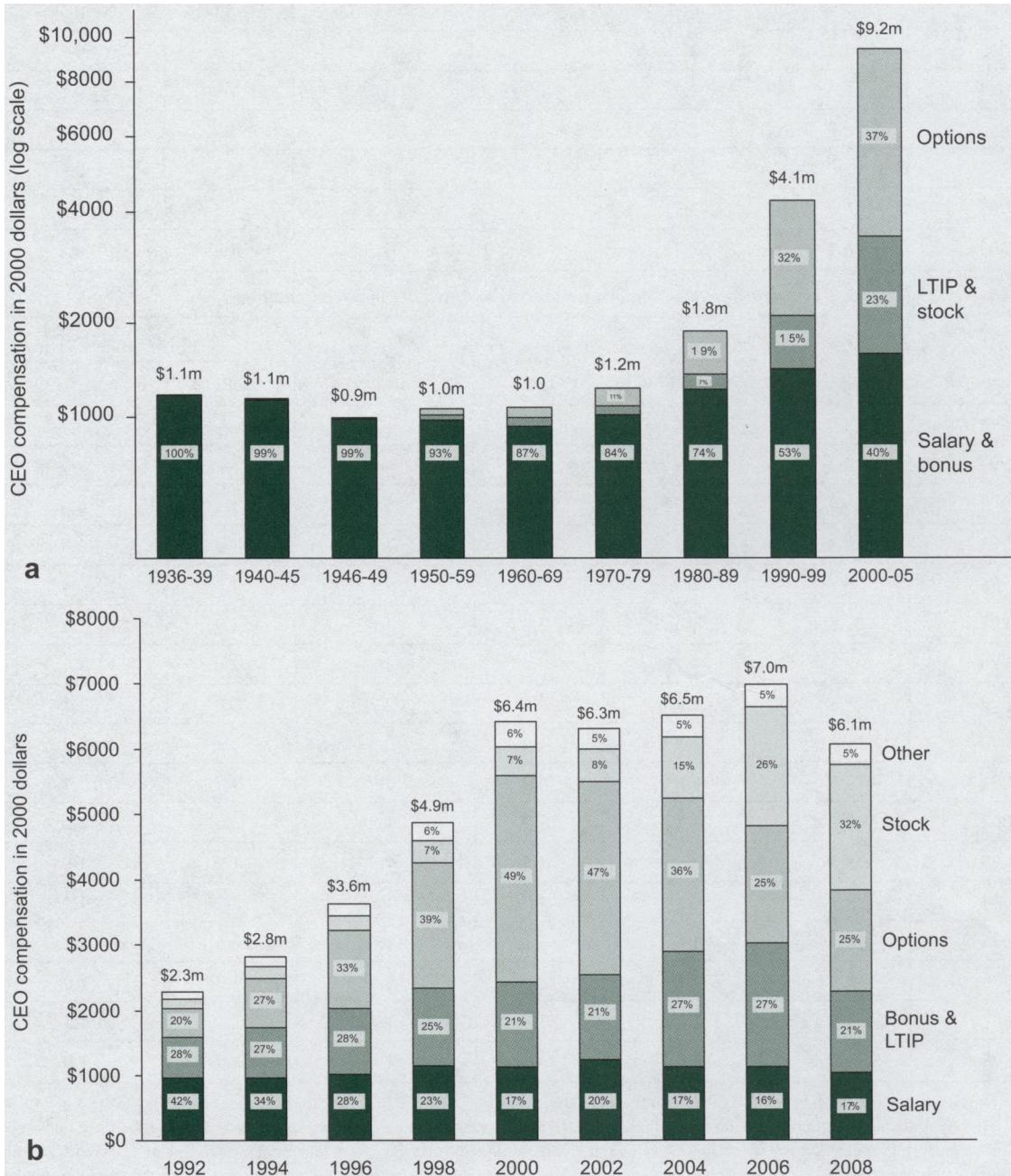
Table 1 (*Continued*)

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
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

*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.

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, the growth in pay has been larger for CEOs than for other top executives, raising the compensation premium for CEOs.



2.2. 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.

Figure 2a 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. As today, bonuses were 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 2a 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 at the labor income tax rate. 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. Figure 2b illustrates this development for S&P 500 CEOs from 1992 to 2008. 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, and any theory that attempts to explain the growth in CEO pay needs to account for this important change in the structure of pay as well. 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 2000-2001, stock options seem to have lost some of their luster, both in relative and absolute terms,

Figure 2

The structure of CEO compensation. (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 are 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 components of pay that can be separately tracked over the long run: 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). Note that the vertical axis is on a log scale. (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. The figure depicts total compensation and its main components: salaries, bonuses and payouts from long-term incentive plans, the Black-Scholes value of option grants, the grant-date values of restricted stock grants, and miscellaneous other compensation (perquisites, contributions to benefit plans, discounts on stock purchases, etc.). For both panels, 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.

and restricted stock grants replaced them as the most popular form of equity compensation by 2006. This evolution in the structure of pay was similar for non-CEO top executives in S&P 500 firms, as well as for all top executives in S&P MidCap and S&P SmallCap firms.

Explaining the stark changes in the structure of compensation since the 1980s remains an open challenge. It is possible that the explosion in option use was prompted by tax policies that made performance-based pay advantageous and by accounting rules that downplayed the cost of option compensation to the firm (Murphy 2002, Hall & Murphy 2003). Moreover, 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 in recent years.² 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.

2.3. 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 been difficult until recent years. Because of the insufficient disclosure, perquisites, pensions, and severance pay have often been labeled “stealth” compensation that may allow executives to extract rents surreptitiously (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). Because most defined benefit pensions are unsecured and unfunded claims against the firm, these retirement benefits can be justified as a form of “inside debt” that mitigates risk-shifting problems by aligning executives’ incentives with those of other unsecured creditors (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 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). Perks appear to be a more general signal of weak corporate governance, as reductions in firm value upon the revelation of perks substantially exceed their actual cost (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. By contrast, 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.

²Hall & Murphy (2003) and Bergman & Jenter (2007) argue that managers are more willing to accept options after stock market booms.

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 & Yermack (2007) use their own calculations and estimate annual increases in pension values to be approximately 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 pensions can result in 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 are 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 as a result of their firm being acquired. The stock market tends to react positively to the adoption of golden-parachute provisions (Lambert & Larcker 1985), and such provisions became widespread during the 1980s and 1990s (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.³

2.4. Brief Summary

Both the level and the composition of CEO pay have changed dramatically over time. The post-World War II era can be divided into at least two distinct periods. Prior to the 1970s, we observe 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 grew dramatically, and differences in pay across executives and firms widened. By far, the largest increase was in the form of stock options, which became 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 2000–2001 and the financial crisis of 2008.

3. 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, empire

³See Almazan & Suarez (2003), Manso (2009), and Inderst & Mueller (2009) for models of optimal severance pay.

building, and preference for a quiet life suggests that the principal-agent problem is potentially highly detrimental to firm values (Jensen & Meckling 1976, Jensen 1986, Morck et al. 1990, Bertrand & Mullainathan 2003).

Executive compensation can be used to alleviate the agency problem by aligning managers' interests with those of shareholders (Jensen & Meckling 1976). In principle, an executive's 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.⁴

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. The data reviewed in this section show that the sensitivity of CEO wealth to firm performance surged in the 1990s, mostly owing to rapidly growing option holdings. At the same time, most CEOs' fractional equity ownership remains low, which suggests that moral hazard problems remain relevant.

3.1. 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 best explains differences in the level of pay across firms (Roberts 1956, Lewellen & Huntsman 1970). The next generation of studies tried to quantify managerial incentives by relating changes in executive pay to stock price performance (Murphy 1985, Coughlan & Schmidt 1985). Although these studies found the predicted positive relationship between executive compensation and shareholder returns, they systematically underestimated the level of incentives by focusing on current pay (Benston 1985, Murphy 1985). Most executives have considerable stock and option holdings in their employer, which directly tie their wealth to their employer's stock price performance. For the typical executive, the direct wealth changes caused by stock price movements are several times larger than the corresponding changes in their annual pay.

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 nonfirm wealth, and on the probability that the CEO is dismissed. Jensen & Murphy (1990b) are the first to integrate most of these effects in a study of large publicly traded U.S. firms for the 1974–1986 period. They find an increase in CEO wealth of only \$3.25 for every \$1000 increase in firm value and conclude that corporate America pays its CEOs like bureaucrats (Jensen & Murphy 1990a).

Table 2 reproduces the Jensen & Murphy (1990b) result using data from 1936 to 2005 for the top three executives in large U.S. firms. To calculate the Jensen-Murphy measure of

⁴In 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).

Table 2 Managerial incentives and equity holdings from 1936 to 2005*

	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)
1936–1940	1.350	18,670	1,566,287	0
1941–1949	0.399	6,814	679,429	0
1950–1959	0.452	13,975	1,169,857	0
1960–1969	0.675	38,978	2,333,663	212,150
1970–1979	0.470	21,743	1,281,266	244,082
1980–1989	0.551	34,679	1,604,861	926,869
1990–1999	0.946	120,342	4,068,013	3,622,806
2000–2005	1.080	227,881	4,966,035	7,160,898

*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.

incentives (the “dollar change in wealth for a dollar change in firm value,” or simply the fractional equity ownership), 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.⁵

Column 1 of Table 2 shows that the fractional equity ownership of the median executive declined sharply in the 1940s, recovered in the next two decades, and shrank again in the 1970s. Although this measure of incentives has increased rapidly since the 1980s, its level has yet to recover its pre–World War II value. Figure 3 zooms in on the more recent evolution of median CEO incentives in S&P 500 firms from 1992 to 2005. Consistent with the long-run sample, the Jensen-Murphy fractional ownership statistic has steadily increased: In 1992, a typical S&P 500 CEO received approximately \$3.70 for a \$1000 increase in firm value; by 2005, her gain was almost \$6.40.

⁵Jenter (2002) shows that measuring incentives as the sensitivity of option values to performance is problematic for risk-averse CEOs. Options tend to pay off in states in which CEOs’ marginal utility is already low, which means that the actual incentives created for a given sensitivity are much smaller for options than for stock.

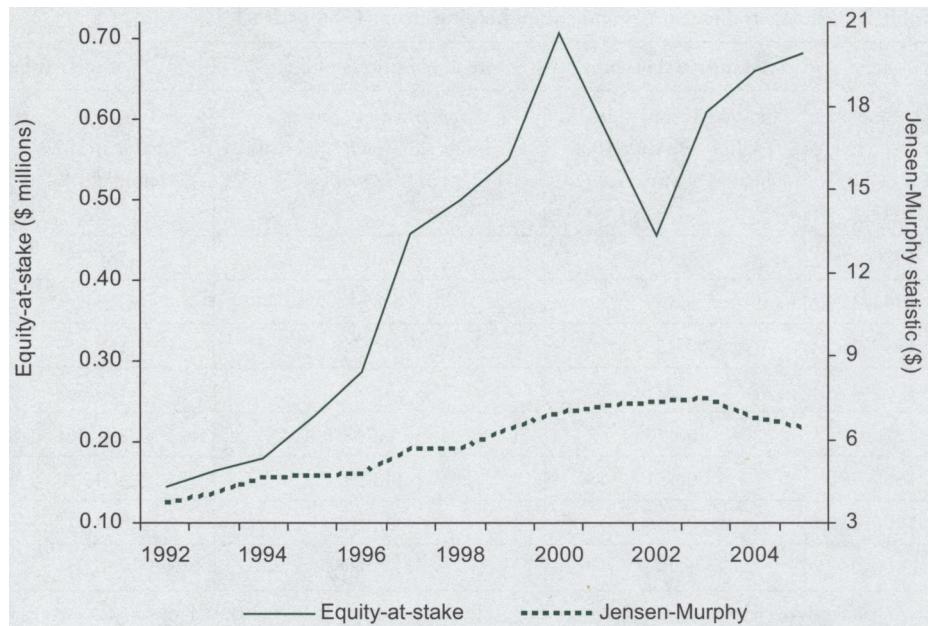


Figure 3

CEO incentives in S&P 500 firms from 1992 to 2005. 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 \$1000 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 \$1000. 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.

In contrast to Jensen & Murphy (1990b), 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. Hall & Liebman (1998) propose the "dollar change in wealth for a percentage change in firm value," i.e., the value of equity-at-stake, as a measure of CEO incentives. Column 2 of Table 2 reports the median equity-at-stake statistic for the top three executives in large U.S. firms from 1936 to 2005. Although Hall-Liebman's equity-at-stake follows a similar pattern of ups and downs as the Jensen-Murphy measure over time, it paints a very different picture of the strength of incentives toward 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 2000–2005 period at 12 times their level in the 1936–1940 period. The sharpest increase in incentives occurred during the 1990s and 2000s. For S&P 500 firms, Figure 3 shows that

the value of equity-at-stake for a typical CEO increased more than fourfold, from \$144,000 per 1% increase in firm value in 1992 to \$683,000 in 2005.

The juxtaposition of the findings by Jensen & Murphy (1990b) with those by Hall & Liebman (1998) highlights that alternative measures of pay-performance sensitivities can lead to very different views on the magnitude of incentives. 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). Nevertheless, both measures rose from the 1970s to the 2000s despite further increases in firm size, mostly as a result of rapidly increasing option holdings. By 2000–2005, the median large-firm executive holds stock options worth \$7.2 million, significantly larger than her stock holdings of \$5 million, and almost 30 times her option holdings in 1970–1979 (columns 3 and 4 of **Table 2**).

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 past three decades. By contrast, executives' fractional equity ownership has always been low and is even lower today than in the 1930s. Because of these conflicting signals about executives' incentives, we examine the merits of the different incentive measures in more detail next.

3.2. 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 (see, among others, Jensen & Murphy 1990b, Joskow & Rose 1994, Garen 1994, Hall & Liebman 1998, Murphy 1999, Baker & Hall 2004, and Edmans et al. 2009). 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 an unnecessary corporate jet or overpaying for an acquisition. 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. Because CEOs engage in both types of activities, both measures of incentives are important and should be looked at independently.⁶ The high values of equity-at-stake and the low fractional ownership levels in **Figure 3** suggest that today's CEOs are well motivated to optimally reorganize their firm but may still find it optimal to waste money on corporate jets.

⁶A 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), and is the correct measure of incentives when the effort choice of the CEO has a multiplicative effect on both CEO utility and firm value (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 of 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).

3.3. Are Incentives Set Optimally?

Determining whether observed compensation contracts optimally address the moral hazard problem between shareholders and CEOs is difficult. One issue is that executive pay may be linked to firm performance for reasons other than providing incentives, such as sorting talented executives to firms (Lazear 2004) and efficient bargaining over profits (Blanchflower et al. 1996). An even more vexing challenge is that 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 (1990b) 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 about 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 1999b, Himmelberg et al. 1999, Jin 2002, Garvey & Milbourn 2003).⁷ Moreover, 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 et al. (2003) find the opposite result for total CEO pay. Gibbons & Murphy (1992) predict that incentives should be strongest for CEOs close to retirement to substitute for declining career concerns, and they find consistent evidence for cash compensation. By contrast, Yermack (1995) and Bryan et al. (2000) find no evidence that CEOs near retirement receive or 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, and especially equity incentives, should be stronger in firms with greater growth opportunities (Smith & Watts 1992, Gaver & Gaver 1995), whereas others report a negative correlation between these two variables (Bizjak et al. 1993, Yermack 1995).

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. Consistent with this prediction, bonus plans frequently link their payouts to the performance of the firm relative to an industry benchmark. However, the

⁷In contrast, Core & Guay (2002b) find a positive correlation between stock-price variance and pay-performance sensitivity, contrary to the predictions of the basic model.

overall evidence for the effective use of relative performance evaluation is weak (Murphy 1985; Coughlan & Schmidt 1985; Antle & Smith 1986; Gibbons & Murphy 1990; Janakiraman et al. 1992; Garen 1994; Aggarwal & Samwick 1999a, 1999b; Murphy 1999). The reason for the overall lack of benchmarking is that wealth-performance sensitivities are driven by revaluations of (nonindexed) stock and option holdings.⁸ As a result, 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 (see, for example, Aggarwal & Samwick 1999a, Himmelberg & Hubbard 2000, Jin 2002, Jenter 2002, Garvey & Milbourn 2003, and Gopalan et al. 2009).

3.4. Brief Summary

Since Jensen & Murphy (1990b), 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 surged in the 1990s, mostly owing 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.

4. 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.

4.1. Theoretical Explanations for the Rise in CEO Pay

The rent extraction view of executive pay 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. Although this argument is

⁸Recent evidence shows that some firms link the vesting of option and stock awards to firm performance relative to a peer group (Bettis et al. 2010a).

intuitive, recent theoretical work explores how inefficient compensation can be sustained in market equilibrium. Kuhnen & 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 firms with strong and weak governance coexist in the economy. Acharya & Volpin (2010) and Dicks (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 be matched with more able CEOs by an efficient labor market (Rosen 1981, 1982). Small increments in CEO talent can imply large increments in firm value and compensation because of 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 sixfold increase in average CEO pay between 1980 and 2003 can be fully explained by the sixfold 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 past 30 years have increased the effect of CEO effort and talent on firm value and, therefore, also led to higher 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 the firm (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, 2009b), 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, Campbell et al. 2001). 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 the 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 higher CEO turnover, a stronger link between CEO turnover and firm performance, and more external CEO hires. However, an economy-wide strengthening of governance may not lead to higher pay in equilibrium if the change also causes CEOs' outside opportunities to become less appealing (Edmans & Gabaix 2010).

4.2. The Empirical Evidence

Many of the theories described above 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 over this period. However, as we argue in this section, these theories have trouble explaining CEO compensation in earlier decades as well as recent cross-sectional patterns they were not designed to match.

4.2.1. 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, 2010b). 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).⁹ Finally, CEO pay increases following exogenous reductions in takeover threats (Bertrand & Mullainathan 1998) and decreases following regulatory changes that strengthen board oversight (Chhaochharia & Grinstein 2009).

A further suggestive piece of 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 approximately 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). However, option backdating may

⁹Jenter & 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.

also arise as a consequence of boards' desire to avoid accounting charges and earnings dilution. It remains to be shown whether backdating was in fact associated with rent extraction by CEOs.

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 past 30 years; instead, most indicators show that governance has considerably strengthened over this period (Holmström & Kaplan 2001, Hermalin 2005, Kaplan 2008). Moreover, "awarding" pay by allowing managers to extract some rents can be optimal if monitoring is costly. In equilibrium, rent extraction may be compensated for through reductions in other forms of pay, thus not leading to higher total compensation. Consequently, observing that a CEO receives forms of pay usually associated with rent extraction does not necessarily imply that the CEO's compensation exceeds the competitive level.

In defense of the managerial power hypothesis, it is possible that the desire or ability of managers to extract rents (and increase their total pay) emerged only 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.¹⁰ 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).

4.2.2. Evidence for and against competitive pay. Market-based and optimal contracting explanations for the rise in CEO pay have also received considerable empirical support. For example, 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. Although 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 skills 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 described in Section 2, 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

¹⁰However, Frydman & Molloy (2010) suggest that changes in the high tax rates prevalent during this period had, at most, modest short-run effects on executive pay.

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.

As detailed in Section 4.1, Hermalin (2005) argues that rising CEO pay is the result of stricter monitoring of CEOs by boards and large shareholders. This view is broadly consistent with the empirical evidence. 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). Although 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 increases 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 has been criticized in several studies. Frydman & Saks (2010) show that the relationship between firm size and CEO pay is highly sensitive to the time period chosen, as this correlation is almost nonexistent from the 1940s to the early 1970s. Moreover, the post-1970s relationship may not be robust to different sample-selection choices (Nagel 2010). Finally, because both the size of the typical firm and CEO compensation have trended upward 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 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. Consequently, 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).

4.3. 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 these theories provides a fully convincing explanation for the apparent regime change in CEO compensation that occurred during the 1970s. Moreover, both approaches fail to explain the explosive growth of options in the 1990s and their recent decline in favor of restricted stock, which may be, in part, a response to changes in accounting practices. Although a combination of the proposed explanations may explain the changes in CEO pay in recent decades, the relative importance of the different theories remains an open question.

5. 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 has 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 measuring 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 entire board of directors, compensation consultants, and the managerial labor market. As a result, compensation arrangements are correlated with a large number 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.

5.1. 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 an influential 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 while the subsequent negative effect is the result of increasing managerial entrenchment and actions adverse to minority shareholders. Using two larger cross sections of firms, McConnell & Servaes (1990) find that firm value increases until the equity ownership by managers and directors exceeds 40-50% 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. 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). Because equity holdings are the decision of managers and boards, none of these correlations can be interpreted as causal.

Several studies use instrumental variables to address the endogeneity of managers' equity incentives (e.g., Hermalin & Weisbach 1991, Himmelberg et al. 1999, Palia 2001). However, as Himmelberg et al. (1999) point out, valid instruments for managerial ownership are extremely difficult to obtain, because all known determinants of ownership are also likely determinants of Tobin's Q. As an alternative strategy, some papers account for the endogeneity of managerial ownership by estimating a simultaneous equation system. However, this approach requires at least as many exogenous as endogenous variables in the model, leaving the challenges in finding valid instruments unsolved. Because of the lack of credible instruments, this literature has been unable to identify the causal effects of managerial incentives on firm value.

5.2. 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 decisions and financial policies.

Many of the early studies in this literature focus on accounting-based long-term incentive plans. The introduction of such 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 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 & Vlijh 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 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, whereas convexity in executives' portfolios due to options is correlated with more risk taking (see, for example, Tufano 1996, Guay 1999, Rajgopal & Shevlin 2002, Lewellen 2006, and Coles et al. 2006).

5.3. Incentive Compensation and Manipulation

Any form of incentive compensation entails the danger that managers may manipulate the performance measure.¹¹ 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

¹¹See Bolton et al. (2006), Goldman & Slezak (2006), and Benmelech et al. (2010) for models of performance manipulation.

incentives and earnings manipulation (Cheng & Warfield 2005, Bergstresser & Philippon 2006, Burns & Kedia 2006, Efendi et al. 2007, Peng & Röell 2008, Johnson et al. 2009). 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, whereas Armstrong et al. (2009) find that CEO equity incentives have, if anything, a modestly negative effect on restatements, SEC enforcement releases, and class action lawsuits.

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

6. CONCLUSION

Both the executive compensation literature and our understanding of pay practices have grown tremendously in recent years. Yet, many important questions remain unanswered. For example, 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 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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