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Does the use of peer groups contribute to higher pay and less efficient compensation?☆

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ABSTRACT

We provide empirical evidence on how the practice of competitive benchmarking affects chief executive officer (CEO) pay. We find that the use of benchmarking is widespread and has a significant impact on CEO compensation. One view is that benchmarking is inefficient because it can lead to increases in executive pay not tied to firm performance. A contrasting view is that benchmarking is a practical and efficient mechanism used to gauge the market wage necessary to retain valuable human capital. Our empirical results generally support the latter view. Our findings also suggest that the documented asymmetry in the relationship between CEO pay and luck is explained by the firm's desire to adjust pay for retention purposes and is not the result of rent-seeking behavior on the part of the CEO.

1. Introduction

> One of the great, as-yet-unsolved problems in the country today is executive compensation and how it is determined
> William H. Donaldson, former Securities and Exchange Commission chairman, at the National Press Club, August 2003

An important method that boards of directors use when determining chief executive officer (CEO) pay is to compare the current level of the CEO's compensation with compensation at a peer group of similar companies. While common, this practice is controversial. One potential problem with benchmarking pay in this manner is that pay raises can be independent of CEO or firm performance. This particular concern, among others, led the Conference Board Commission on Public Trust and Private Enterprise, which consists of a number of current and former CEOs, to recommend that "the Compensation Committee should exercise independent judgment in determining the proper levels and types of executive compensation to be paid unconstrained by industry median compensation statistics." A contrasting viewpoint, however, is that benchmarking represents an efficient way to determine the reservation wage of the CEO (e.g., Holmstrom and Kaplan, 2003) and is a necessary input to the compensation process. Consistent with this latter view, firms typically contend that they use benchmarking to provide competitive pay packages in order to retain valuable human capital. The purpose of this paper is to

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provide evidence on how this practice affects pay levels and to understand which of these two alternative views better explains the economic motivation for the use of competitive benchmarking.

We begin by providing some analysis on the prevalence of this practice. We review compensation committee reports of 100 firms chosen randomly from the Standard and Poor's (S&P) 500 index in 1997 and find that benchmarking is used extensively, with 96 firms indicating that they use benchmarking or peer groups to determine the levels of executives' salary, bonus, and option awards. The vast majority of the firms that use peer groups target pay levels at or above the 50th percentile of the peer group, although a number of firms seek pay levels well above the peer group median. For example, both Coca-Cola and IBM consistently aim for pay levels in the upper quartile of their peers. We find that peer groups are typically based on industry and size.

Second, we directly examine how benchmarking is related to pay using a sample of CEOs in the Execucomp database over the period 1992–2005. Controlling for numerous economic factors that have been shown to affect compensation, such as market and accounting performance, firm size, and CEO tenure, we find that CEOs who are paid below the median level of their industry- and size-matched peers receive increases in total pay that are $1.3 million per year greater than the raises received by their counterparts whose pay is above the peer group median. In each year, approximately one-third of executives with pay below the peer group median receive pay adjustments that move them to or above the median level of pay for their peer group. We also find that the effect of peer group benchmarking on changes in pay is considerably larger than the effect of stock price performance on changes in pay. These findings indicate that the use of competitive benchmarking is an important component in determining executive pay.

Third, we provide evidence on whether benchmarking is associated with rent extraction on the part of the CEO or whether the practice serves as a mechanism for firms to set a sufficient reservation wage to retain CEO talent. We attempt to distinguish between these competing hypotheses in several different ways. We start by examining the factors that are related to whether or not executives with pay below the peer group median receive pay increases that place them at or above the peer group median.

Executives who have shorter tenure and whose firms exhibit better performance are more likely to receive pay increases that put them above the peer group median. These findings are consistent with the board learning about the ability of the CEO over time (Murphy, 1986) and rewarding CEOs with greater ability. In addition, we find that CEOs are more likely to receive pay increases that bring them to competitive levels if they operate in tighter labor markets. This result is consistent with claims by the compensation committee that benchmarking is done to retain valuable human capital and is similar to the conclusions in Carter and Lynch (2001) and Chidambaran and Prabhala (2003), who find that labor market considerations play a significant role in firms' decisions to reprice employee stock options.

We also examine the effect of corporate governance on the likelihood of receiving a pay increase that places the CEO at or above the median pay level of the peer group. We use several measures of the quality of corporate governance, including the shareholder rights index of Gompers, Ishii, and Metrick (2003), institutional holdings, and board composition. We find no systematic evidence that the use of benchmarking is related to proxies that would indicate poor corporate governance. These findings suggest that the use of peer group benchmarking is more related to economic variables (such as performance and labor market conditions) and less related to variables indicative of managerial entrenchment (such as weak corporate governance).

Fourth, we examine how CEO turnover is affected by the level of the CEO's pay relative to peers. Controlling for other factors that affect turnover, we find that the probability of CEO turnover is higher in firms with CEOs whose pay is below the median pay level of the peer group, but this probability decreases (weakly) if the CEO subsequently receives a pay increase that moves him above the peer group median level of pay. We also find that the sensitivity of CEO turnover to firm performance does not differ with the relative pay status of the CEO. The results on CEO turnover indicate that, while CEOs with pay below the peer group median do receive larger pay adjustments on average, they also face higher rates of turnover. We argue that these results are not consistent with the idea that benchmarking is used opportunistically but are consistent with a retention motive for benchmarking. Further analysis of the employment outcomes for CEOs with pay below the peer group median who leave their firms also supports the retention view. Only 5.2% of departing CEOs obtain a new top executive position at another firm in the Execucomp universe. In addition, firm performance for the CEOs who depart for another top executive position is better compared with firm performance for departing CEOs who do not subsequently take similar positions at other firms. They also move to larger firms and obtain substantial increases in pay that, on average, are above the median compensation levels of the peer group associated with their old firm.

Finally, we examine the degree to which benchmarking can explain the established pay-for-luck phenomenon (Garvey and Milbourn, 2006). Garvey and Milbourn find that CEOs are paid more for good luck than they are punished for bad luck. They conclude that their finding of an asymmetry in pay for luck is indicative of the CEO's ability to act opportunistically in setting pay. We argue for a different conclusion and contend that the asymmetry in pay for luck is more consistent with the use of benchmarking by firms to gauge the market reservation wage for their executives when the outside opportunities of the CEO are correlated with market- and industry-wide factors (i.e., luck) as suggested by Oyer (2004).

The results are generally consistent with this view. We find no asymmetry in the relation between pay and luck for CEOs with current pay levels above that of their peers (i.e., highly paid CEOs) but significant asymmetry in the response of pay to luck for CEOs whose current pay is below that of their peers. All of the asymmetry in the

sensitivity of pay to luck shown in Garvey and Milbourn is found in the group of CEOs with pay below the peer group median. In addition, we find no evidence that the asymmetry in the sensitivity of pay to luck in either pay group is associated with weaker corporate governance. Together, the results are inconsistent with the view that asymmetry in the response of pay to luck is driven by opportunistic behavior of CEOs who have captured the pay process. Instead, we view the results as more supportive of the idea that the relation between pay and luck is an artifact of the use of competitive benchmarking as a tool for gauging the reservation wage of the CEO.

The remainder of this paper is organized as follows. Section 2 uses data from corporate proxy statements to provide a description of how firms use peer groups and competitive benchmarking to set executive pay. Section 3 provides empirical evidence on how benchmarking affects CEO pay. Section 4 examines the motivations behind the use of competitive benchmarking and provides evidence on the association between the use of benchmarking and the pay for luck relation. Section 5 concludes. Finally, the Appendix contains a sample of compensation committee reports that discuss the use of competitive benchmarking.

2. How firms benchmark pay

Most firms use a compensation committee composed of members of the board of directors to structure executive pay. Typically, the compensation committee relies on research and recommendations from the human resource department oftentimes working in conjunction with outside consultants [see Murphy (1999) and Jensen, Murphy, and Wruck (2005) for a more detailed discussion of the use of compensation consultants]. As a basis for analyzing pay practices within the firm, consultants and the compensation committee often use information on pay practices at comparison or peer companies, which are usually similar-size firms from the same industry. In most firms, salary and, either directly or indirectly, target bonuses and option pay are anchored to the peer group. In assessing target pay levels, salary and bonus and total pay below the 50th percentile are usually considered below market.

To provide some initial evidence on how peer groups are used to determine executive compensation, Table 1 summarizes information on the use of peer groups for a random sample of 100 firms listed in the S&P 500 index. Data come from 1997 corporate proxy statements. Firms are given some flexibility in what they are required to report in the proxy statements. Consequently, the evidence presented in this section is primarily descriptive. Nevertheless, it sets the stage for our empirical analysis in the sections that follow.

We find that the use of peer groups is widespread. As seen in the table, 96 of the 100 firms report that peer groups are used in determining compensation. Two firms report that they do not use peer groups, and two firms do not mention peer groups in the proxy. Firms seldom report the exact composition of the peer group used. The overwhelming majority of firms (92), however, report the use of peer groups based to some degree on size or industry or both.[1] Seventy-three firms mention targeting one or more of the components of pay at either the median or mean of the peer group.[2] Five firms mention targeting salary below the mean or median of their

Table 1
Descriptive analysis of the use of peer groups by firms to structure chief executive officer (CEO) compensation. The table contains data on the number of firms that use peer groups in setting CEO pay, the number of firms that use compensation consultants, the type of pay that is targeted, the number of firms that use median as the target benchmark, the number of firms that use relative performance evaluations, and the number of firms that use the same peer group in the performance graph and compensation comparison purposes. Data come from a random sample of one hundred firms contained in the Standard & Poor's 500. Most of the information is from the compensation committee report on executive pay contained in the corporate proxy statements for 1997. The number of firms that report the use of compensation consultants when establishing pay is probably understated, because firms are not required to mention whether outside consultants are used.

Compensation characteristics	Number of firms
Number of firms that mention using peer groups to set executive pay as reported in the compensation committee report on executive pay	96
Number of firms that report the use of compensation consultants when establishing pay	65
Number of firms that mention targeting at least one component of pay at or above the peer group median or mean as reported in the compensation committee report on executive pay	73
Number of firms that mention firm size or industry or an equivalent when establishing the peer group for compensation comparisons as reported in the compensation committee report on executive pay	92
Number of firms that state they use relative performance evaluation when making comparison to the peer group as reported in the compensation committee report on executive pay	15
Number of firms that use different peer groups for compensation comparisons and stock-price performance comparisons (the latter being required by the SEC) as reported in the compensation committee report on executive pay	90

[1] Size and industry, however, are not the only comparison criteria used. For example, the 1997 proxy statement of Ball Corp. states that for comparison purposes the company examines "the pay of similarly situated executives at other manufacturing firms of similar size (based upon total employment and sales), capital structure, customer base, market orientation and employee demographics."

[2] While not all the components of pay are always discussed as being evaluated relative to a peer group, our reading of the compensation committee reports seems to indicate that in most cases all of the components of pay are set relative to a peer. For example, some companies mention only salary as being set comparable to a peer and do not discuss that bonuses or option pay are directly evaluated relative to the comparison group. In these cases, however, both bonus pay and option pay are set as a multiple of salary. Consequently, any correction of salary to adjust pay to the peer also is reflected in the other components of pay.

respective benchmarks. In these cases, however, while salary is set below the median, bonus and option pay is set at or above the median (Green Tree Financial Services Inc. is one example). For 23 of the firms, no specific target relative to the benchmark is mentioned, even though the firms use peer groups to set salary or other components of pay. The Appendix contains selected passages from the compensation committee reports for a number of firms, which further illustrate how firms use competitive benchmarking in setting pay.

While the analysis above suggests that the use of peer groups is common, the practice has generated considerable controversy. One potential problem with setting pay using peer groups is that the practice could institutionalize increases in the different components of pay that are not directly linked to performance measures. In the majority of the proxy statements analyzed, no mention was made that the values of the actual bonus or option grants were given for performance that met or exceeded that of the peer group.[3] Others have also spoken out about the use of competitive benchmarking. For instance, Walter Wriston, former chairman and CEO of Citicorp, and member of the compensation committee at General Electric Co stated, "[Setting compensation] has become a giant ratchet. Every board's compensation committee opens with: Here is a graph of the compensation of the 50 largest companies in America, and our sterling CEO is in the third quartile. So you're getting these huge salaries …. [and] some of the highest-paid people have had the worst performance" (Wall Street Journal, 1991). More recently, Edgar Woolard Jr., former CEO of Dupont and director at firms such as IBM, Apple, and Citigroup, commented that "the main reason compensation increases every year is that boards want their CEO to be in the top half of the CEO peer group, because they think it makes the company look strong" (Harvard Business Review, 2003, p. 72).

Further, Hall (2003) notes that "the proposition that the increased use of compensation surveys has contributed to the rise in executive pay is consistent with … the views of practitioners—including executives and compensation consultants themselves." Similarly, Jensen, Murphy, and Wruck (2005, p. 56) state, "We believe that the misuse of survey information provided by compensation consultants has led to systematic increases in executive pay levels. … [T]he surveys have contributed to a 'ratchet' effect in executive pay levels."

Others have responded to these concerns by arguing that competitive benchmarking is necessary to determine market wages for purposes of attracting, retaining, and motivating employees. Jensen, Murphy, and Wruck (2005) point out that "the managerial labor market has become relatively more important for top executives in the US". Consequently understanding the wages in the external market for CEOs has become more important. Without having information on the executives' outside opportunities, it can be difficult to set a wage rate that provides a level of pay necessary for retention purposes. Because wages are set in a competitive labor market, the use of benchmarking is necessary to determine the market wage. Holmstrom and Kaplan (2003) argue that "[t]he main problem with executive pay levels is not the overall level, but the extreme skew in the awards …. To deal with this problem, we need more effective benchmarking, not less of it." We explore these contrasting viewpoints in greater detail in Section 4.

3. The effect of competitive benchmarking on CEO pay

The discussion in Section 2 suggests that the practice of competitive benchmarking is widespread and an important part of how executive compensation is set. To date, however, almost no empirical research shows the degree to which benchmarking affects overall pay levels. In this section, we begin by examining how the practice of competitive benchmarking affects the level of CEO pay.

3.1. Compensation data

Compensation data used for the analysis in the rest of the paper come from the Standard & Poor's Execucomp database for the period 1992–2005. We focus on individuals classified as CEOs by Execucomp. The database indicates the dates when the CEO assumed office and when the CEO left office but, in some cases, fails to identify an executive as the CEO even though he or she appears to be the CEO based on these dates. We classify these individuals also as CEOs. We restrict our analysis to CEOs who have at least 2 years of tenure. This ensures that we do not consider pay increases of individuals who were appointed as CEOs during the year and thus received CEO compensation only for part of the year. Because compensation data are highly skewed, we winsorize the compensation variables at the 1st and 99th percentile levels. All of our subsequent results using the raw data are qualitatively similar to those reported.

Table 2 presents summary statistics for the sample. The primary compensation measure we use is total pay, which consists of salary, bonus, new option grants, grants of restricted stock, and long-term incentive payouts. Other measures of pay we consider are cash compensation (salary and bonus) and the Black and Scholes value of option grants each year. Mean cash compensation (salary and bonus), mean option compensation, and the mean total compensation for our sample, stated in 2005 dollars, are $1.55 million, $2.51 million, and $5.01 million, respectively. The mean change in total pay over the sample period is $359,000. These numbers are comparable to those reported in other recent studies that use

[3] The peer group that is used to analyze compensation is often different from the peer group that is used in the performance graph, which firms are required to present in the proxy. One company we looked at, Amoco Inc., discussed how the pay raises for the current year were given to raise pay levels to the industry median. Amoco, however, had underperformed the companies selected in the performance graph for the last couple of years. Byrd, Johnson, and Porter (1998) discuss the selection of firms reported in the performance graphs contained in proxy statements, and Faulkender and Yang (2007) examine the choice of peer group firms for 83 companies that reported the firms used for compensation comparisons in 2005.

Table 2
Summary statistics on compensation and firm characteristics. The sample covers the period 1992–2005. Data on chief executive officer (CEO) compensation are obtained from Execucomp. Financial information is from Compustat. Cash compensation includes salary and bonus. OPTION is the Black and Scholes value of stock option grants each year as provided in Execucomp. Total compensation includes salary, bonus, other annual compensation, total value of restricted stock granted, total value of stock options granted (using Black and Scholes), long-term incentive payouts and all other. Δcash compensation is cash compensation$_t$−cash compensation$_{t-1}$. ΔOPTION and Δtotal compensation are similarly defined. ROA is the ratio of earnings before interest, taxes, depreciation, and amortization (EBITDA) to assets. Return is the annual stock return for the fiscal year. All dollar values are in 2005 dollars. Only CEOs with at least 2 years of tenure (as CEO) are considered.

Compensation or firm characteristic	Mean	Median	Minimum	Maximum	Number of observations
Cash compensation (thousands of dollars)	1,555	1,080	0	127,124	15,329
OPTION (thousands of dollars)	2,509	664	0	679,014	15,329
Total compensation (thousands of dollars)	5,006	2,371	0	787,018	15,329
Δcash compensation (thousands of dollars)	99	45	−2,062	2,736	15,329
ΔOPTION (thousands of dollars)	118	0	−19,537	17,412	15,329
Δtotal compensation (thousands of dollars)	359	122	−22,589	20,433	15,329
Sales (millions of dollars)	4,809	1,213	0.18	328,213	15,319
Annual stock return	0.22	0.12	−0.98	19.00	15,329
Return on assets	0.13	0.13	−2.99	0.97	15,191

Execucomp data (for example, Garvey and Milbourn, 2006; Himmelberg and Hubbard, 2000).

3.2. Construction of compensation peer groups

To analyze the influence of peer groups on compensation we need to rank executives based on their pay levels relative to those of their peers. As discussed in Section 2, however, firms seldom report the actual composition of their compensation peer groups. Based on evidence from the compensation committee reports that most peer groups appear to be based on firms of similar size (usually based on revenues) and in similar industries, we construct proxies for peer group pay levels in the following manner.[4]

First, for each year, and within each industry [two-digit standard industrial classification (SIC)], we rank all firms according to the prior year's sales. We classify firms as being in the large (small) firm group if they have sales above (below) the median sales in the industry. Second, we rank all firms within each industry and sales category into two groups based on the level of the prior period compensation measure. We classify executives as being in the high (low) compensation group if their prior period compensation is above (below) that of the median executive in the comparison group. We use the median pay level for partitioning compensation because most compensation committees consider pay above the median in an industry and size peer group to be competitive and consider compensation levels below the median to be below market. This formation of two peer groups based on size and industry should reflect the manner in which firms form groups for compensation comparison purposes.

We recognize that the partitioning is imperfect in that not all firms use only a size and industry comparison grouping. To the extent that firms use other partitions (or do not use peer groups at all), our power to capture any effect of peer groups in setting compensation is weakened. Another concern is that CEOs handpick the peer group to maximize their compensation. Under this scenario we would expect CEOs to select peer firms that have compensation much higher than their own, even if their pay is already above the median pay at other firms in the peer group formed based on size and industry. Again, this misclassification weakens our ability to detect the effects of benchmarking on pay.

3.3. Analysis of the effects of competitive benchmarking on CEO compensation

We begin with analysis of the relative effects that firm performance and competitive benchmarking have on changes in CEO pay. Table 3 reports the results. Panel A presents the frequency with which CEOs receive pay increases or decreases across various deciles of performance conditioned on the pay level of the CEO relative to the peer group. Performance here is measured as the firm's returns for that year net of the median returns for the peer group. We break the sample down by performance because performance is tied to changes in CEO pay (e.g., Jensen and Murphy, 1990). Our pay measure is total compensation.

As Panel A illustrates, in both relative pay groups the fraction of CEOs receiving pay increases goes up almost monotonically across performance deciles. More important for our purposes, in every performance decile, the frequency of pay increases for CEOs with pay below the peer group median is much higher than that for CEOs with pay above the peer group median. For the lowest (highest) performance decile, 51% (80%) of the CEOs with pay below the peer group median receive an increase in pay while only 31% (63%) of the CEOs with pay above the peer group median receive an increase in pay. Panel B shows a similar pattern for dollar increases in compensation. The dollar increases are considerably greater for CEOs with pay below the peer group median for all performance deciles.

[4] A discussion with an executive at a leading compensation consulting firm indicated that the process as described by us and referred to in proxy statements is an accurate portrait of how competitive benchmarking operates.

Table 3
Summary statistics on pay increases as a function of performance and relative pay status. Data on chief executive officer (CEO) compensation are obtained from Execucomp and are described in Table 2. To form peer groups, observations are ranked each year within each two-digit industry into two sales groups (high and low) based on prior year median sales. They are then ranked into two compensation groups (high and low) based on prior year median compensation. The size and industry rankings are meant to mimic the typical peer group as described in proxy statements. Firms are then grouped into performance deciles for each year based on the firm's stock returns in that year in excess of the peer group median stock returns (1 = worst, 10 = best). Panel A reports the percentage of firms in each group that had a pay increase. Panel B reports the actual pay increase for each group. In Panel C, firms are ranked into relative pay deciles each year based on their total compensation for the prior year relative to the corresponding median total compensation for their peer group. Above median performance indicates that the firm's peer group adjusted returns are above the median value. All dollar values are in 2005 dollars. Only CEOs with at least two years of tenure (as CEO) are considered.

Relative performance decile	Pay above peer group median	Pay below peer group median
Panel A: Percentage of firms with compensation increases		
1 (worst)	30.9%	51.4%
2	36.9	55.2
3	42.5	63.0
4	46.7	66.5
5	52.5	69.9
6	52.2	72.7
7	54.3	73.6
8	56.2	74.5
9	58.3	75.7
10 (best)	63.3	80.3
Panel B: Dollar increase (decrease) in compensation across performance deciles (thousands of dollars)		
1 (worst)	$ (2,100.90)	$618.49
2	$ (898.86)	$658.25
3	$ (790.64)	$837.55
4	$(122.92)	$842.56
5	$(446.70)	$822.81
6	$(158.02)	$927.02
7	$132.11	$927.04
8	$475.02	$1,007.05
9	$401.12	$1,296.30
10 (best)	$1,428.05	$1,438.69

Panel C: Dollar increase (decrease) in compensation across relative pay deciles (thousands of dollars)

Relative pay decile	Performance above peer group median	Performance below peer group median
1 (farthest above median)	$(2,290.89)	$ (5,356.20)
2	$1,074.99	$ (206.23)
3	$1,401.74	$257.28
4	$ 982.34	$460.15
5	$1,026.00	$290.56
6	$862.75	$438.02
7	$793.45	$561.63
8	$1,151.25	$784.64
9	$1,249.30	$730.11
10 (farthest below median)	$1,601.85	$1,274.94

Panel C reports the average dollar pay increases across deciles of relative pay for firms with above and below median performance. We sort firms into deciles based on their pay relative to the median pay of their peer group. Decile 1 (Decile 10) corresponds to the firms that are farthest above (farthest below) the peer group median in terms of their pay. We also sort firms each year into two groups based on their stock returns relative to the peer group median. The results in Panel C indicate that, in general, CEOs receive larger raises when their pay is further below the pay of the peer group, which is consistent with what we observe in Panels A and B. Moreover, within each decile of relative pay, CEOs of firms with above median performance receive bigger raises compared with CEOs of firms with below median performance. This suggests that benchmarking is not totally independent of performance. Although not reported, the results in all panels are qualitatively similar when we use either cash compensation or option grants as the measure of pay.

To provide further evidence on how benchmarking affects pay, Table 4 reports the results from ordinary least squares regressions that examine whether the CEO's pay status relative to the peer group affects pay changes after controlling for other factors that are related to CEO pay. The dependent variable is the change in total compensation from year $t-1$ to year t. As control variables we include the log of firm size in year $t-1$, dollar changes in sales, net income and the market value of equity from year $t-1$ to year t, and CEO tenure. These regression specifications are similar to those used by Jensen and Murphy (1990). We also perform a number of robustness tests.

In Model 1, we include a dummy variable for the CEO's pay status relative to the median level of CEO pay in the size and industry peer group. The dummy variable identifying pay relative to the peer group equals one when compensation is below the peer group median in the ranking year ($t-1$). We refer to this dummy variable as LOWCOMP. Correspondingly, the dummy equals zero when compensation in the prior year is above the peer group median. The coefficient estimate on the LOWCOMP variable measures the average effect of pay status relative to the peer group on dollar changes in compensation over the following year. The results indicate that, after controlling for firm size and firm performance, CEOs with pay below the peer group median in year $t-1$ receive pay increases in year t that are, on average, about $1.3 million more than their counterparts with pay levels above the peer group median. The coefficient estimate on the LOWCOMP variable is statistically significant at the 1% level.

In Model 2, we replace the LOWCOMP dummy variable with a continuous measure of relative pay. To construct this measure, each year, for each firm, we first calculate the difference between the median lagged compensation for the peer group and the lagged compensation of the CEO. This number is positive if pay is below the peer group median and is negative when pay is above the peer group median. If pay relative to the peer group has an effect on compensation, then we expect changes in pay to be greater when this measure is larger. The results are consistent with this view. The coefficient estimate on the variable measuring relative pay is positive and is significant at the 1% level. According to our

Table 4
OLS regressions of dollar changes in total compensation. The sample is from Execucomp and is described in Table 2. The dependent variable is Δtotal compensation (total compensation$_t$−total compensation$_{t-1}$). Total compensation includes salary, bonus, other annual compensation, total value of restricted stock granted, total value of stock options granted (using Black and Scholes), long-term incentive payouts, and all other. Δsales is defined as the sales$_t$−sales$_{t-1}$. Δnet income is defined as the net income$_t$−net income$_{t-1}$. Δshareholder wealth is defined as the market value$_t$−market value$_{t-1}$. LOWCOMP is a dummy variable that takes the value one if the CEO was below the median compensation of his peer group (i.e., below median compensation of his size and industry counterparts) and is zero otherwise. Distance from peer group median is the peer group median compensation in the prior year minus the CEO's compensation in the prior year (a positive number indicates that the CEO is below the median). Relative performance is the firm's performance net of the peer group median performance. *Cdf* relative performance and *cdf* distance are the cumulative distribution functions of relative performance and distance from peer group median respectively. Data on CEO compensation are obtained from Execucomp. Financial information is from Compustat. Compensation (thousands of dollars), and sales, net income and shareholder wealth (all in millions of dollars) are expressed in year 2005 dollars. Only CEOs with at least 2 years of tenure (as CEO) are considered. *p*-Values are in italics.

Independent variables	Dependent variable: change in total compensation					
	Model 1		Model 2		Model 3	
	Coefficient	*p*-Value	Coefficient	*p*-Value	Coefficient	*p*-Value
Intercept	−965.30	*0.000*	−298.19	*0.100*	−3,383.49	*0.000*
Log(sales$_{t-1}$)	83.49	*0.001*	104.01	*0.000*	135.12	*0.000*
Δsales	0.15	*0.000*	0.16	*0.000*	0.19	*0.000*
Δnet income	−0.04	*0.390*	−0.04	*0.400*	−0.05	*0.376*
Δshareholder wealth	0.05	*0.000*	0.04	*0.000*		
CEO tenure	1.82	*0.734*	3.78	*0.465*	1.51	*0.775*
LOWCOMP	1,316.95	*0.000*				
Distance from peer group median			0.11	*0.000*		
Cdf relative performance					1,888.22	*0.000*
Cdf distance					3,562.17	*0.000*
Number of observations	13,845		13,845		13,847	
r^2	0.034		0.104		0.067	

findings, a one standard deviation change in relative pay is associated with a $1.42 million increase in total compensation.

Finally, in Model 3 we examine whether relative pay or relative performance matters more for determining compensation. To do so we construct the cumulative distribution function (*cdf*) of the continuous relative pay variable. We construct a similar measure for performance. For each firm-year we calculate the return of the firm net of the median return for its peer group. We then compute the *cdf* for this measure. A larger value for this measure indicates better firm performance relative to the peer group. The use of the *cdf* of relative pay and relative performance allows us to compare economically the coefficients on these variables. As expected, the coefficients on both the *cdf* of pay as well as the *cdf* of performance are positive and statistically significant. According to Model 3, moving from the 1st percentile to the 100th percentile of pay relative to the peer group median is associated with an increase in total compensation of about $3.6 million. This confirms and extends our earlier finding that, all else equal, CEOs receive bigger pay hikes when their pay is below the median of the peer group and that the pay raises are tied to the difference between the pay of the CEO and the pay of the median firm in the peer group. Relative performance does not have as large an impact on pay increases as does pay relative to the peer group. The results indicate that, on average, CEO pay increases by only $1.9 million when moving from the 1st percentile to the 100th percentile of the relative performance distribution. This effect is only about one-half of the size of the effect of the peer group ranking on changes in pay.

Overall, the results suggest that the use of peer groups has a nontrivial effect on pay levels of CEOs. Similar results (not reported) are obtained when we separately examine how peer group benchmarking affects cash compensation and option pay, although the effect of benchmarking on option pay is substantially larger than its effect on cash compensation. The result for option pay suggests that at least some portion of the dramatic growth in the use of stock option-based compensation shown in Hall and Liebman (1998) can be accounted for by the increased value of option grants to lower paid CEOs via the peer group benchmarking process. Finally, we also replicate the analysis in Table 4 for non-CEO executives of the firm (not reported). Using a classification scheme similar to Aggarwal and Samwick (2003) to identify non-CEO executives, we find that executives with pay below that of their industry- and size-matched peers receive larger increases in pay. This result suggests that competitive benchmarking is an integral part of the process used for determining pay levels throughout the firm.

3.4. Additional robustness tests

Although our regressions control for many factors that should affect CEO compensation, our findings could suffer from an omitted variable problem. To the extent that any omitted variables are correlated with our measure of relative pay status, our results could arise from spurious

correlation between the omitted variables and our peer group measure. To assess the robustness of our results we estimate four alternative specifications for the regressions in Table 4. (1) We control for the market-to-book ratio (to proxy for growth opportunities), total debt scaled by assets, CEO ownership, and governance-related variables. (2) We use industry- or firm-fixed effects along with year-fixed effects. (3) We incorporate the lagged value of the pay measure as an additional explanatory variable. (4) We estimate median regressions to allow for the fact that compensation data are skewed (although this is less of a problem because we winsorize the compensation variables). In all cases, the coefficient estimates on LOWCOMP remain statistically significant at the 1% level. Similarly, in all but one specification, the coefficient on the continuous measure of relative compensation is significant at 1% (in the one exception, it is significant at 12%). Finally, in all cases the coefficients on the *cdf* of relative pay and the *cdf* of performance continue to be significant at the 1% level. Furthermore, the coefficient on the *cdf* of relative pay is always larger than the coefficient on the *cdf* of relative performance.

4. Motivations for the use of competitive benchmarking

The analysis in Section 3 illustrates that competitive benchmarking appears to be an important factor used to determine executive pay. Nevertheless, the question remains as to whether the practice is used to provide pay increases not justified by the labor market or whether the practice helps to identify the reservation wage that is necessary to attract and retain talent. In this section we provide a variety of tests that help to discriminate between these two views.

4.1. Factors affecting the use of competitive benchmarking

To begin, we focus our attention on the group of executives with prior year pay below the peer group median. Within this group of executives we examine the factors that are associated with pay increases that move the CEO to or above the peer group median pay level. If competitive benchmarking is used to adjust compensation to a competitive level, we expect that pay adjustments to the peer group median are associated with better firm performance and tighter labor markets. Alternatively, if executives routinely receive pay increases to the peer group median level, regardless of firm performance, or if the pay increases are not related to labor market conditions, this would suggest that the practice of competitive benchmarking is used to justify pay increases that are not supported by the economic environment. If benchmarking is being used to gauge the market wage of the CEO, we also expect that pay increases are associated with CEO tenure. Newer CEOs who the firm wants to retain are more likely to receive significant pay increases as the firm learns about their abilities over time. In contrast, if CEOs with longer tenure are more likely to receive substantial pay increases, then this could indicate that the practice of benchmarking is used opportunistically to increase the pay levels of entrenched CEOs. Finally, we expect that if benchmarking is used opportunistically, then poorly governed firms are more likely to grant large pay increases to executives.

Table 5 presents the results of logit regressions that examine these hypotheses. The sample is all firm years with CEO pay below the peer group median at the beginning of the year. The dependent variable is equal to one for CEOs with pay below the peer group median in the previous year who receive a pay increase in the current year that places them at or above the peer group median level of pay. The dependent variable is equal to zero for CEOs who did not get a pay increase that places them above the peer group median in the current year.

Independent variables include firm size measured as the log of sales, CEO tenure, firm performance measures, variables that proxy for labor market conditions, and governance-related variables. Our measures of firm performance include stock and accounting returns (return on assets). The variables that we use for labor-market conditions include firm age, a technology industry indicator, the overall unemployment rate in the economy, and industry sales growth. Chidambaran and Prabhala (2003) argue that younger firms have less well developed lines of succession relative to older firms and therefore management turnover could be more costly for younger firms. Such firms could place more emphasis on managerial retention. We include the high-tech sector dummy because these firms arguably faced a tighter labor market, at least through 2000 (Carter and Lynch, 2001). This indicator variable is as defined in Chidambaran and Prabhala (2003). We include industry sales growth as a proxy for the demand for executive talent in the industry. Industry sales growth is computed as the ratio of aggregate industry sales (sum of firm sales across each two-digit SIC) each year to the aggregate industry sales in the prior year. The unemployment rate, which is the overall rate of unemployment for the US labor market as computed by the Bureau of Labor Statistics, is included as a proxy for overall labor market conditions.[5]

We also examine three governance variables. The first is the index of shareholder rights (the GIM index) constructed by Gompers, Ishii, and Metrick (2003). Higher values of the index indicate weaker shareholder rights.[6]

[5] We also use other measures of employment to capture labor market effects and our inferences are similar. For example, we use the change in real gross domestic product (GDP) (*source*: Bureau of Economic Analysis) and the change in aggregate industry employment separately as proxies for labor market conditions. We expect that labor market tightness increases with these two variables. When using changes in GDP to measure labor market conditions, we find the coefficient estimate is positive and significant at the 1% level in Models 1 and 3. When using aggregate industry employment, similar to the specification using the unemployment rate, we find the coefficient is of the correct sign (that is, positive) but not significant in Model 1 ($p = 0.23$) and significant in Model 3 ($p = 0.03$).

[6] While some criticism has been presented of the Gompers, Ishii, and Metrick measure (see, for example, Lehn, Patro, and Zhao, 2005), it is widely used in the literature as a measure of the quality of corporate governance. The governance characteristics that affect the value of the index include takeover defenses, state laws governing takeovers, differential voting rights, and protection of officers and directors through

Table 5
Analysis of the factors related to competitive benchmarking. The sample consists of Execucomp firms with chief executive officers (CEOs) who had total compensation below that of the corresponding peer group median in the prior year. The dependent variable equals one if the CEO received a pay raise that placed him at or above the peer group median and is zero otherwise. Total compensation includes salary, bonus, other annual compensation, total value of restricted stock granted, total value of stock options granted (using Black and Scholes), long term incentive payouts, and all other. TECH is an indicator variable that takes the value one if the firm is in the high-tech industry, as defined in Chidambaran and Prabhala (2003). Industry sales is the aggregate sales for each industry (two-digit standard industrial classification) for each year. Industry sales growth is the ratio of current year's industry sales to the prior year's industry sales. Unemployment rate is taken from the Bureau of Labor Statistics. GIM index is the governance index of Gompers, Ishii, and Metrick (2003). The governance index measures the strength of shareholder rights, based on 24 governance provisions for the firm. Institutional ownership is the percentage of the firms shares held by institutions. Institutional shareholding data are from Thomson Financial and are available for the period 1992–2004. Board data are from Investor Responsibility Research Center and are available for the period 1996–2005. Nonindependent is a dummy that equals one if the firm has a majority of nonindependent directors on the board. ROA is the return on assets. All dollar values are in 2005 dollars. Compensation (thousands of dollars), and sales, net income and shareholder wealth (all in millions of dollars) are expressed in year 2005 dollars. Only CEOs with at least 2 years of tenure (as CEOs) are considered. *p*-Values are in italics.

Independent variables	Dependent variable equals one if CEO pay was below median last year and got bumped up to above median, and is zero otherwise					
	Model 1		Model 2		Model 3	
	Coefficient	*p*-Value	Coefficient	*p*-Value	Coefficient	*p*-Value
Intercept	−2.116	*0.00*	−3.066	*0.00*	−2.652	*0.00*
Log(sales)	0.168	*0.00*	0.162	*0.00*	0.192	*0.00*
CEO and performance-related						
Return	0.267	*0.00*			0.331	*0.00*
ROA	0.738	*0.00*			1.069	*0.01*
CEO tenure	−0.014	*0.00*			−0.003	*0.59*
Labor market-related						
TECH	0.210	*0.00*			0.273	*0.01*
Log(firm age)	−0.137	*0.00*			−0.112	*0.04*
Unemployment rate	−0.044	*0.22*			−0.221	*0.00*
Industry sales growth	0.634	*0.00*			0.508	*0.08*
Governance-related						
GIM index			0.017	*0.21*	0.037	*0.01*
Institutional ownership			1.498	*0.00*	1.312	*0.00*
Nonindependent board			−0.267	*0.01*	−0.313	*0.00*
Pseudo-r^2	0.023		0.027		0.041	
Number of observations	6,798		3,813		3,430	

The second measure of governance is INSTPC, which measures the percentage of the firm's shares held by institutions. We expect higher levels of institutional shareholdings to be associated with better governance. The third governance measure is an indicator variable based on the fraction of nonindependent directors (inside directors+affiliated directors) on the board. This variable, MAJORITY_NONINDEP equals one for a given year if more than 50% of the firm's directors are not independent (i.e., the firm has poorer governance) and equals zero otherwise.[7] The board data are obtained from Investor Research Responsibility Center (IRRC) and are available only for the period 1996–2005, while our institutional holdings data are taken from Thomson Financial and are available from 1992 to 2004.

Model 1 of Table 5 reports the results with the performance measures, CEO tenure, and labor market variables included. We use firm size as a control variable. We find that both stock market and accounting performance are positively related to the likelihood that the CEO receives a pay increase that moves them to or above the peer group median pay level. In addition, CEO tenure is negatively related to the likelihood of a pay increase. With respect to the labor market related variables, we find that the likelihood of receiving a pay increase to market levels is higher when the firm is in the high-tech industry and when industry sales growth is higher. The likelihood of receiving a pay increase is negatively related to the age of the firm and to the unemployment rate, although the coefficient estimate on the unemployment rate is not statistically significant. Model 2 reports results for the governance variables. The likelihood of a pay increase is not significantly related to the value of the GIM index. The probability of a pay increase is increasing in institutional ownership and is negatively related to having a majority of nonindependent directors. Model 3 repeats the regression with all variables included. All of the previous results continue to hold with the exception that the coefficient on CEO tenure becomes insignificant and the coefficients on

(*footnote continued*)
Director & Officer insurance and severance agreements. See Gompers, Ishii, and Metrick (2003) for a more detailed discussion of the construction and characteristics of the index.

[7] Many papers show that more independent boards appear to take actions that are more in shareholder interests (for example, Weisbach, 1988; Brickley, Coles, and Terry, 1994; Borokhovich, Parrino, and Trapani, 1996; Cotter, Shivdasani, and Zenner, 1997).

Table 6
Analysis of chief executive officer (CEO) turnover as a function of relative pay status. The sample is from Execucomp and is described in Table 2. The dependent variable equals one if the identity of the CEO changes and equals zero otherwise. LOWCOMP is a dummy variable equal to one if the CEO's pay was below the median compensation of the peer group (i.e., below the median compensation of size and industry matched counterparts) and is zero otherwise. ROA is the ratio of earnings before interest, tax, depreciation, and amortization (EBIDTA) to assets. Returns are stock returns for the fiscal year. Age dummy equals one if the CEO is between 64 and 66 years of age and equals zero otherwise. *Pay increased* is a dummy variable equal to one if the CEO received a pay increase that moved him above the peer group median. Only CEOs with at least 2 years of tenure (as CEOs) are considered. *p*-Values are in italics.

Independent variables	Dependent variable equals one if there is CEO turnover in year t+1 and is zero otherwise					
	Model 1		Model 2		Model 3	
	Coefficient	*p*-Value	Coefficient	*p*-Value	Coefficient	*p*-Value
Intercept	−3.376	*0.000*	−3.392	*0.000*	−3.377	*0.000*
ROA	−0.532	*0.091*	−0.514	*0.104*	−0.532	*0.091*
Return (b_1)	−0.349	*0.000*	−0.341	*0.000*	−0.328	*0.001*
CEO age dummy	1.532	*0.000*	1.534	*0.000*	1.532	*0.000*
CEO ownership	−0.017	*0.004*	−0.017	*0.003*	−0.017	*0.004*
Log(sales)	0.153	*0.000*	0.155	*0.000*	0.153	*0.000*
Lowcomp	0.143	*0.031*	0.196	*0.008*	0.148	*0.031*
Lowcomp × pay increased			−0.164	*0.108*		
Lowcomp × return (b_2)					−0.038	*0.784*
Number of observations	10,880		10,880		10,880	
Pseudo-r^2	0.052		0.053		0.052	
Sensitivity of turnover to performance for below median firms ($= b_1$+b_2) $= -0.366$, $p = 0.000$						

the GIM index and unemployment rate become significant.

The results in Table 5 generally support the idea that benchmarking is used in a manner consistent with firms adjusting pay for retention purposes. The likelihood of receiving a pay increase is positively related to firm performance and to proxies for tighter labor market conditions. With respect to governance, some evidence exists that pay increases are associated with weaker shareholder rights as measured by the GIM index. The results based on institutional ownership and board structure, however, lead to opposite conclusions; namely, that CEOs of firms with poorer corporate governance are less likely to receive pay increases that place them above the median pay of the peer group. These conclusions are similar to those drawn in the studies of option repricing by Carter and Lynch (2001) and Chidambaran and Prabhala (2003). These studies find that, at least on average, repricing is not systematically associated with managerial entrenchment.

4.2. Competitive benchmarking and CEO turnover

In this sub-section we examine how CEO turnover is related to the competitive benchmarking process. If the board employs competitive benchmarking to make compensation decisions to retain valuable human capital, then CEOs in the below median pay group who receive raises to competitive pay levels should be less likely to leave the firm. In addition, to the extent that the board uses firm performance to assess the quality of the CEO, turnover should be sensitive to accounting and stock returns. Alternatively, if competitive benchmarking reflects managerial entrenchment, then CEOs in the below median pay group should face little risk of job loss, even when their performance is poor.

Table 6 presents results from logit regressions measuring the effects of peer group pay ranking on turnover rates and the sensitivity of turnover to firm performance. The dependent variable in all the model specifications equals one when the identity of the CEO changes. The independent variables include measures of stock and accounting returns and the LOWCOMP indicator of peer group pay ranking. We also include an indicator variable if the CEO's age is between 64 and 66, as in Murphy and Zimmerman (1993), to proxy for the normal retirement age of the CEO, and we control for CEO ownership following Denis, Denis, and Sarin (1997) who find that the probability of turnover decreases with higher CEO ownership. Firm size, computed as the log of sales is included as a control variable. The independent variables are measured in the year prior to the year in which turnover is calculated. The empirical specifications are similar to those used in previous literature that examines the relation between turnover and firm performance (e.g., Warner, Watts, and Wruck, 1988; Weisbach, 1988; Parrino, 1997; Denis, Denis, and Sarin, 1997).

In Model 1, consistent with prior studies, we find that the likelihood of turnover is higher when the CEO is in the 64–66 age-group, when prior stock market and accounting performance are weaker, and when CEO ownership is lower. The coefficient estimate on the LOWCOMP indicator is positive and is statistically significant at the 5% level indicating that, all else equal, overall rates of CEO turnover are higher in firms with CEOs whose pay is below the peer group median. In Model 2, we include an indicator variable that equals one if the CEO's pay was below the median compensation level of the peer group, but the CEO received a raise in the year prior to turnover that placed

him above the peer group median pay level. The coefficient estimate on this indicator variable is negative, although only weakly statistically significant ($p = 0.11$). The sign of the coefficient estimate indicates that CEOs who saw their pay moved to competitive levels are less likely to depart, which is consistent with the retention motive for benchmarking.

Last, we examine whether the sensitivity of CEO turnover to stock price performance is different across CEOs who are in the above median pay group and CEOs in the below median pay group. In Model 3, the interaction between LOWCOMP and stock returns is not statistically significant, which indicates that both relative pay groups face similar sensitivities of turnover to performance. (The overall sensitivity of turnover to performance for CEOs with pay below the peer group median is significantly negative, $p < 0.01$. See the last row of Table 6.)

In general, the results do not support the notion that competitive benchmarking rewards CEOs with higher pay levels in a way that also shelters them from poor performance. Instead, the results are consistent with competitive benchmarking being used with discretion by the board to retain valuable human capital. To shed some additional light on the relation between turnover and benchmarking, we examine labor market outcomes for the subsample of departing CEOs in the below median pay group who did not receive raises that moved their pay to competitive levels. We exclude CEOs with ages between 64 and 66 from the analysis.

We find that, of the departing CEOs in the subsample we examine, only 5.2% (23 individuals) subsequently appear in new executive positions at firms within the Execucomp universe. Moreover, compared with the other departing CEOs, the ones who obtain a new CEO position have better stock price performance in the year prior to departure (average stock returns of 15.4% versus 9.5%). In addition, the average ratio of firm sales in the CEO's new firm versus his old firm is 3.2 and the average ratio of total compensation in the new position compared with the old position is 5.2. These findings provide some additional support for the view that the board employs discretion in using benchmarking as a retention tool. Following poor performance, CEOs whose pay is below the peer group are less likely to receive pay raises that move them to market levels, are more likely to be dismissed, and are less likely to appear in similar or better positions at other firms. In the few cases in which departing CEOs find new executive positions, it appears that these CEOs are moving to more prestigious jobs and retention would have been costly (e.g., see Fee and Hadlock, 2003).

4.3. Competitive benchmarking and pay for luck

The standard principal agent model predicts that compensation should be independent of factors that are beyond the control of the manager, such as market and industry returns. In contrast to this prediction, Bertrand and Mullainathan (2001) find that CEO pay responds strongly to "luck" (i.e., market and industry factors), and Garvey and Milbourn (2006) show that the relation between pay and luck is asymmetric (managers are rewarded for good luck but are insulated from bad luck). Both sets of authors conclude that the evidence is supportive of the view that, on average, managers capture the pay process in a manner that allows them to extract rents. In contrast to this view, Oyer (2004) and Himmelberg and Hubbard (2000) suggest that pay can appear to respond to luck when the outside opportunities of the manager are correlated with industry and market conditions.

In this section we explore this latter view by examining the role that competitive benchmarking plays in understanding the asymmetry in the relation between CEO pay and luck. We develop a simple example of how the use of competitive benchmarking for retention purposes is manifested in pay for luck. We then test the predictions of the retention model and compare the results against the alternative hypothesis that the relation between pay and luck is indicative of rent extraction on the part of the CEO.

4.3.1. A simple example of CEO retention and pay for luck

To provide some structure for the empirical tests, we develop a simple example that is similar in spirit to Oyer (2004). In our extension of Oyer's model, we show that not only do firms tie pay to firm performance for retention purposes but also that adjustments in pay following a market or industry shock are a function of previous levels of pay.

We begin by assuming that the firm hires a CEO and signs the CEO to a long-term contract to work for the firm over two or more periods. The CEO has negative exponential utility and the executive is paid based on firm value, where the value of the firm at time t is given by $V_t = \mu + L_t + \varepsilon_t$. Firm value depends on two random variables. The first shock, L, is called luck and could represent returns to the market or the firm's industry. The second shock, ε, is firm specific risk unrelated to luck. Luck can take on one of two values, $L \in \{\theta_l, \theta_h\}$, where $\theta_l < 0 < \theta_h$ and where q is the probability that $L = \theta_h$. The firm-specific shock is assumed to be normally distributed with a mean value of zero and variance of σ^2.

The CEO's wage is given by a contract of the form $W_t = w_{t-1} + b * V_t$ where w_{t-1} is the initial wealth of the CEO at time $t-1$. The level of initial wealth that the CEO has entering period t is assumed to be exogenous. One way to think about this initial wealth is that it is related to the CEO's pay from the prior period. We do not address why there is dispersion in wages among CEOs to begin with and instead focus on how pay is adjusted to provide retention incentives in response to shocks to the market wage of the CEO.[8] With this framework, the certainty equivalent utility of the CEO is given by $CE_t = E[W_t] - rVar(W_t)$ where r is the risk aversion coefficient.

[8] We also subsume the fixed wage component at time t into the CEO's wealth at time $t-1$. The board could choose to adjust the fixed wage of the CEO as a function of luck and avoid exposing the CEO to any firm-specific risk (see Oyer, 2004). We assume that the unmodeled need to provide incentives for effort requires wages to be sensitive to firm value.

Similar to Oyer (2004), we assume that the reservation wage of the CEO is correlated with luck and is given by $S \in \{S_l, S_h\}$, where S_l is the reservation (market) wage of the CEO when luck is down and S_h is the reservation wage of the CEO when luck is up. Further, we assume that the realization of luck is observed by the board prior to the time that the contract is written in period t. If the CEO's pay is not expected to meet the reservation utility of the CEO, then she leaves the firm. We assume that, if the CEO leaves, the firm incurs a replacement cost of k. The existence of replacement costs implies that the firm prefers to keep the incumbent CEO. The CEO remains employed as long as

$$S_l < w_{t-1} + b\theta_l - rb^2\sigma^2 \quad (1)$$

and

$$S_h < w_{t-1} + b\theta_h - rb^2\sigma^2. \quad (2)$$

After the realization of luck is observed, the board has discretion to adjust the terms of the CEO's contract; namely, the parameter b, which determines the sensitivity of pay to firm value. After luck is observed, the board adjusts b, such that

$$b_{down} = \frac{\theta_l + \sqrt{\theta_l^2 - 4r\sigma^2(S_l - w_{t-1})}}{2r\sigma^2} \quad \text{when luck is down} \quad (3)$$

and

$$b_{up} = \frac{\theta_h - \sqrt{\theta_h^2 - 4r\sigma^2(S_h - w_{t-1})}}{2r\sigma^2} \quad \text{when luck is up.} \quad (4)$$

For our purposes it is useful to consider two CEOs, one that enters period t with outside wealth equal to S_l and one that enters at period t with outside wealth equal to S_h. For the first CEO (with low outside wealth) the board sets

$$b_{down} = 0 < b_{up} = \frac{\theta_h - \sqrt{\theta_h^2 - 4r\sigma^2(S_h - S_l)}}{2r\sigma^2}, \quad (5)$$

where the relation on the left-hand side of the inequality follows from the fact that $\theta_l < 0$. For the second CEO, the board sets

$$b_{down} = \frac{\theta_l + \sqrt{\theta_l^2 - 4r\sigma^2(S_l - S_h)}}{2r\sigma^2} > 0 = b_{up}. \quad (6)$$

In other words, to provide retention incentives to the first CEO, the board reduces the pay performance sensitivity when luck is down because the CEO is already near the low reservation wage but allows the CEO to capture a greater share of firm value when luck is up to ensure that the CEO's pay is commensurate with the CEO's outside opportunities. For the second CEO, the opposite is true. The board would like to decrease the CEO's pay in response to bad luck and to minimize any rents to the CEO when luck is up.

To the extent that CEOs with current pay that is either above or below the peer group median are representative of CEOs who enter the contracting period with high or low wealth, respectively, the model suggests that changes in pay that are associated with luck should be different depending on the pay ranking of CEO pay relative to the peer group in the prior period. To retain the services of the CEO, the board of directors could be more reluctant to reduce compensation for CEOs who are currently paid below their peers when luck is bad but allows pay to increase with luck when luck is good to meet the reservation wage needed to retain the CEO. In contrast, for CEOs with current pay that is already high compared with the peer group, the model suggests that the board should allow pay to fall with luck when luck is bad but should reduce the pay-for-luck sensitivity when luck is good to minimize the rents earned by the CEO.

The contrasting hypothesis is that CEOs have captured the pay process, which can also result in an asymmetry in pay for luck as argued by Garvey and Milbourn (2006). We argue, however, that the rent extraction story would not result in the same type of asymmetry in pay for luck. In particular, if the rent extraction story is true, we expect to observe greater asymmetry in pay for luck in the above median pay group. CEOs who are already paid above their peers are the ones more likely to have captured the pay process compared with CEOs who are paid below their peers. If the rent extraction story can explain pay for luck, we would expect highly paid CEOs to be the ones able to shelter pay when luck is down and capture the benefits when luck is up. In contrast, we would not expect the low-paid CEOs to have captured the pay process, and consequently we would expect to observe less asymmetry in pay for luck for that group of CEOs.

4.3.2. Analysis of pay for luck and competitive benchmarking

To examine how competitive benchmarking affects the relation between pay and luck, we follow the empirical methodology of Garvey and Milbourn (2006, hereafter GM). Identical to GM, we first identify changes in firm value that are associated with luck and skill. To do this we regress the firm's raw stock returns on the equal-weighted and value-weighted industry returns using two digit SIC codes. Predicted values calculated using the coefficient estimates on the two industry portfolios represent changes in firm value associated with luck. The residuals from this regression represent the firm-specific component of returns and correspond to what we refer to as skill. The performance measures are converted to dollar values by multiplying the predicted and residual stock returns by market capitalization at the beginning of each year. Similar to GM, we eliminate all firms that do not have a December fiscal year-end. Summary statistics on our empirical estimates of luck and skill are similar to GM. For example, the median predicted dollar values of luck and skill from our regression are \$195 million and −\$47 million, while their median values are \$155 million and −\$35 million respectively.

To test the effects of luck and skill on pay, we use changes in total compensation as the dependent variable. Independent variables include the measures of luck and skill and the interaction of our luck and skill variables with the *cdf* of each firm's respective luck and skill volatilities. Interacting the luck and skill variables with their respective *cdfs* provides a better empirical

specification to test the effects of firm characteristics on pay for performance (see Aggarwal and Samwick, 1999, and GM for more discussion of this specification). Similar to GM, we define a dummy variable that equals one when the luck (skill) measures are negative and include the interaction term between the dummy variables and the respective luck and skill measures. The interaction variables partition the data to measure the sensitivity of pay for luck (skill) when luck (skill) is down relative to the sensitivity of pay for luck (skill) when luck (skill) is up. As in GM, we include as control variables the dollar variance of the market value of equity, CEO tenure, year-fixed effects, and firm-fixed effects.

The basic model specification, which is identical to the one employed by GM, is

$$\begin{aligned}\Delta Compensation_{it} = {} & a + b_1 \times Luck_{it} + b_2 \times Skill_{it} \\ & + b_3 \times Luck_{it} \times Luck\ Down_{it} \\ & + b_4 \times Skill_{it} \times Skill\ Down_{it} \\ & + b_5 \times Luck_{it} \times cdf\ of\ Variance\ of\ Luck_{it} \\ & + b_6 \times Skill_{it} \times cdf\ of\ Variance\ of\ Skill_{it} \\ & + Control\ Variables_{it} + \varepsilon_{it}. \end{aligned} \quad (7)$$

If executives are paid for good luck but not punished equally for bad luck, the coefficient estimate on the luck times luck is down dummy variable, b_3, is negative. Similarly, the coefficient b_4 measures any asymmetry in the sensitivity of pay to skill.

Panel A of Table 7 presents the benchmark model that duplicates the basic specification testing for asymmetry in pay for luck and skill presented by GM. To ease the presentation, we do not report the full model specification but only the estimates of the overall sensitivity of pay to luck and skill for the median CEO in the sample (i.e., setting the values of the *cdfs* to 0.5). The numbers reported in the table correspond to the dollar change in pay corresponding to a $1,000 change in the measure of interest. Similar to the results reported by GM, we find that CEOs are paid for both luck and skill. Our coefficient estimates suggest that the median CEO receives $0.88 in additional compensation for every $1,000 increase in shareholder wealth due to luck when luck is positive. GM estimate this number to be $0.79. Similar to GM, we find an asymmetry in pay for luck. The median CEO loses only $0.70 for every $1,000 decrease in firm value when luck is negative (bad luck). GM find a reduction of $0.60 cents for each $1,000 decrease in shareholder wealth associated with luck.[9] The null hypothesis that the sensitivities of pay to good luck and to bad luck are the same is rejected at the 1% level. Also, similar to GM we find that there is no such asymmetry associated with pay for skill. The median CEO's pay changes by approximately $1.17, for each $1,000 change in skill, regardless of whether skill is up or down.

To study the extent to which the asymmetry in pay for luck varies by peer group, we augment the empirical model above as follows. Based on the example and discussion above, we expect that pay responds less to luck when luck is down for executives who are paid below their peers (i.e., b_3 is more negative for CEOs with pay below the peer group median) and pay responds more strongly to luck when luck is up (i.e., b_1 is higher for CEOs with pay below the peer group median). To test how the sensitivity of pay to luck and skill varies by peer group pay ranking, we add the LOWCOMP dummy variable and interactions of LOWCOMP with the independent variables associated with parameters b_1 through b_4. The results are presented in Panel B of Table 7. Each entry of the panel presents the estimate of the full effect of pay for luck or pay for skill for that particular subgroup of firms. So, for example, the first cell in the panel is the sensitivity of pay when luck is up for a CEO with prior year pay above the median pay of the peer group. The estimates of the overall sensitivities to luck and skill are calculated at the median variance of luck (i.e., *cdf* of variance of luck = 0.5). The results in Panel B indicate that the level of asymmetry in pay for luck varies significantly across peer group rankings. From the table it is clear that the asymmetry in pay for luck is concentrated in the group of CEOs with pay below the peer group median. For these CEOs, pay increases by $0.82 for every $1,000 increase in firm value associated with good luck but decreases only by $0.36 for every $1,000 decrease in firm value due to bad luck. The hypothesis that the sensitivity of pay to luck is the same when luck is up versus when luck is down is rejected at the 1% level. In contrast, we find no evidence of an asymmetry in the sensitivity of pay to luck in the group of CEOs with pay levels above the peer group median. The results show that all of the asymmetry in the sensitivity of pay to luck shown by GM is driven by CEOs with pay below the peer group median.

The results in the right-hand side of Panel B present the estimates of the sensitivity of pay to skill. Similar to the pay-for-luck analysis, CEOs with pay below the peer group median exhibit an asymmetry in the sensitivity of pay to skill, while those with pay above the peer group median do not. The fact that CEOs with low pay are also insulated from bad outcomes for skill could reflect the idea (as mentioned in GM) that CEOs have opportunities for employment outside the firm or industry, such as working in the public sector, and this sets a floor on wages.[10]

Overall, the results are generally consistent with competitive benchmarking being used for retention motives. Boards of directors at firms with CEOs whose current pay is already low relative to the peer group need to insulate the CEO from bad outcomes (whether due to luck or skill) to prevent CEO pay at these firms from falling below the reservation wage. In contrast, boards at firms with CEOs whose pay is already high relative to their

[9] Our sample includes four additional years of data compared with Garvey and Milbourn (2006).

[10] Downward rigidity in wages is also consistent with work by Harris and Holmstrom (1982). They present a model of an efficient wage contract between a risk-neutral firm and a risk-averse employee when the two parties are unsure of the worker's ability. They argue that the firm enters into a partial insurance contract with downward rigid wages. In their model, the firm insures against adverse realizations of ability but must allow the wage to increase if the ability level is revealed to be high.

Table 7
Estimated sensitivities of pay to good and bad luck and to good and bad skill, as computed from ordinary least squares regressions similar to that in Garvey and Milbourn (2006): Δtotal compensation = a+$b_1 \times$ luck+$b_2 \times$ skill+$b_3 \times$ luck $\times$ luck is down+$b_4 \times$ skill $\times$ skill is down+$b_5 \times$ luck $\times$ *cdf* of variance of luck+$b_6 \times$ skill $\times$ *cdf* of variance of skill+$b_7 \times$ *cdf* of variance of returns+$b_8 \times$ tenure+year dummies+firm dummies. Luck and skill are predicted and residual values from a regression of annual stock returns on the value-weighted and equal-weighted industry (two-digit standard industrial classification) returns. The predicted and residual values are multiplied by the lagged market value of the firm to get the dollar values of luck and skill. *Luck is down* (*skill is down*) is an indicator variable that equals one if the value of luck (skill) is negative. The variance of returns is computed using monthly returns for 5 years preceding the data year. *Cdf* of variance of luck, *cdf* of variance of skill, and *cdf* variance of returns are the cumulative distribution functions of luck, skill, and dollar returns respectively. The values reported in each cell in Panel A represent the sensitivity of total pay to good luck, bad luck, good skill, and bad skill for the median CEO (that is, *cdf* = 0.5). In Panel B, the sensitivities of pay to good and bad luck and to good and bad skill are reported separately for firms with CEOs above and below the median of peer group compensation. These values are calculated based on the OLS regression above, but with four additional terms that represent the first four variables in the regression above interacted with LOWCOMP. LOWCOMP is a dummy variable that takes the value one if the chief executive officer (CEO) was below the median compensation of his peer group (i.e., below median compensation of his size and industry counterparts) and is zero otherwise. In Panel C, the sensitivities of pay to good and bad luck are reported separately for firms with CEOs above and below the median of peer group compensation, as well as for firms with weak and strong governance (WEAKGOV and STRONGGOV). Weak and strong governance are based on the governance index (GIM index) of Gompers, Ishii, and Metrick (2003). A firm is classified as having weak (strong) governance if the firm's GIM index in that year is in the top (bottom) two deciles. Panel D presents the sensitivities of pay to good and bad skill based on whether the CEO's compensation is above or below median and also based on whether the governance is strong or weak. The values in Panels C and D are calculated based on the OLS regression above, but with 20 additional terms (the first four variables in the regression above are interacted with each of LOWCOMP, WEAKGOV, STRONGGOV, LOWCOMP $\times$ WEAKGOV, and LOWCOMP $\times$ STRONGGOV). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Pay for luck and pay for skill

	Sensitivity of total compensation to			Sensitivity of total compensation to		
	Good luck	Bad luck	*p*-Value for difference	Good skill	Bad skill	*p*-Value for difference
All firms	0.879***	0.700***	*0.000*	1.166***	1.176***	*0.695*

Panel B: Benchmarking, pay for luck and pay for skill

CEO relative pay status	Sensitivity of total compensation to			Sensitivity of total compensation to		
	Good luck	Bad luck	*p*-Value for difference	Good skill	Bad skill	*p*-Value for difference
Above peer group median	0.920***	0.863***	*0.241*	1.079***	1.119***	*0.129*
Below peer group median	0.823***	0.364*	*0.000*	1.816***	0.768***	*0.000*
p-Value for difference between above and below median	*0.006*	*0.000*		*0.000*	*0.000*	

Panel C: Benchmarking, governance, and pay for luck

CEO relative pay status	Good luck			Bad luck		
	STRONGGOV	WEAKGOV	*p*-Value for difference	STRONGGOV	WEAKGOV	*p*-Value for difference
Above peer group median	1.091***	1.131***	*0.390*	1.042***	1.132***	*0.632*
Below peer group median	0.767***	0.989***	*0.059*	0.458	0.066	*0.480*
p-Value for difference between above and below median	*0.000*	*0.204*		*0.018*	*0.045*	

Panel D: Benchmarking, governance, and pay for skill

CEO relative pay status	Good skill			Bad skill		
	STRONGGOV	WEAKGOV	*p*-Value for difference	STRONGGOV	WEAKGOV	*p*-Value for difference
Above peer group median	0.904***	1.281***	*0.000*	1.147***	1.196***	*0.265*
Below peer group median	1.892***	1.345***	*0.025*	0.650***	0.983***	*0.029*
p-Value for difference between above and below median	*0.000*	*0.761*		*0.000*	*0.119*	

peers allow CEO pay to fall following bad realizations of both luck and skill. One finding that is inconsistent with the retention story is that firms with highly paid CEOs also allow CEO pay to rise significantly following good luck. Nevertheless, the findings overall appear less consistent with the rent extraction story. As we argued earlier, under this story, the asymmetry in pay to luck should be most prevalent in the group of highly paid CEOs because these are the ones who have likely captured the pay process. This does not appear to be the case.

4.3.3. Analysis of pay for luck, competitive benchmarking, and corporate governance

To provide some final evidence on whether competitive benchmarking is used opportunistically, we examine if the asymmetry in the pay-for-luck relation that we show is systematically associated with corporate governance. Bertrand and Mullainathan (2001) find there is less pay for luck when there is a large blockholder present. GM find there is some evidence of greater asymmetry in pay for luck in firms with weaker corporate governance relative to firms with stronger corporate governance, as measured by the GIM index. We examine whether controlling for corporate governance changes our inferences regarding the relation between the sensitivity of pay to luck and the use of competitive benchmarking.

To capture the effects of corporate governance we follow GM and define the variable WEAKGOV, which is equal to one for firm year observations in the top quintile of values of the GIM index. Correspondingly, we define the variable STRONGGOV, which is equal to one if the value of the firm's governance index is in the bottom quintile of values of the GIM index. In our sample WEAKGOV corresponds to firms with values of the GIM index greater than or equal to 12, while STRONGGOV corresponds to firms with values of the GIM index less than or equal to 7. We repeat the regressions measuring the sensitivity of pay to both luck and skill as a function of relative pay but further partition the sensitivities as a function of the strength of corporate governance.

The results are reported in Table 7, Panels C and D. Panel C of the table reports the results for luck and Panel D reports the results for skill. As seen in the first row of Panel C, for firms with pay levels above the peer group median, the sensitivities of pay to both good and bad outcomes for luck are statistically equivalent across firms with strong and weak corporate governance. Moreover, no evidence exists of asymmetry in the sensitivity of pay to luck as a function of the realization of luck based on the strength of corporate governance. The second row of the panel shows that, for CEOs with pay levels below the peer group median, the sensitivity of pay to good luck is somewhat higher in firms with weak governance, but the asymmetry in pay to luck is evident in both governance categories. The results for skill reported in Panel D are similar. No evidence exists of any asymmetry in pay for skill for CEOs with pay levels above the peer group median, and pay for skill does not differ significantly as a function of corporate governance in these firms. In contrast, firms with pay levels below the peer group median exhibit an asymmetry in pay for skill that is present in both governance categories.

Finally, although not reported, we find qualitatively similar results when we define governance based on quintiles of institutional ownership or using a dummy equal to one if the firm has a majority of nonindependent directors. Overall, although the results vary somewhat based on the specification, there is little evidence that the sensitivity of pay to luck and skill that we show as a function of peer group pay rankings is systematically related to governance characteristics in a way that would support the rent extraction story.

5. Conclusion

The design of executive pay has attracted significant attention in both practitioner and academic circles. The purpose of this paper is to examine the extent to which the use of peer groups and the competitive benchmarking process affects compensation. Firms are required to discuss how they set pay levels in the report of the compensation committee that appears in the firm's proxy statement. Based on these reports we find that the use of peer groups is pervasive. In addition, our results based on data from Execucomp for the period 1992–2005 suggest that the use of peer groups and competitive benchmarking has a nontrivial effect on changes in pay of the CEO. CEOs with pay below the median of their peers receive substantially larger raises compared with CEOs with pay above the peer group median, even after controlling for other factors previously shown to affect compensation.

The use of competitive benchmarking has been criticized on the grounds that it provides a mechanism to reward CEOs that is independent of firm performance. A contrasting viewpoint, however, is that benchmarking represents an efficient way to determine the reservation wage of the CEO and is a necessary input to the compensation process. Consistent with the latter view, we find that the likelihood that CEOs with pay below the peer group median receive a pay increase that moves them above the peer group median pay level is associated with firm performance and proxies for tighter labor market conditions but is not systematically associated with poor corporate governance. In addition, we find that CEOs with pay below the peer group median face significant risk of job loss, which is not consistent with the idea that benchmarking is reflective of CEOs' ability to capture the pay process.

Finally, we provide evidence that the practice of competitive benchmarking as a retention device can explain the asymmetry in the pay-for-luck relation shown by Garvey and Milbourn (2006). We find that the asymmetry in pay for luck is present only for CEOs with pay below the median pay of the peer group. Unlike Garvey and Milbourn, however, we argue that the empirical results do not support the conclusion that asymmetry in pay for luck is a result of CEOs capturing the pay process. Instead, we argue that the asymmetry in pay to firm performance can be explained by retention motives when the outside opportunities of the CEO vary with market and industry conditions.

Although our evidence is consistent with benchmarking being used as a mechanism to gauge the market wage of the CEO, benchmarking as currently practiced could have led to greater increases in pay than would have occurred in its absence. It is difficult, however, to determine how much CEO pay would have increased in the absence of competitive benchmarking, because it is hard to imagine how firms could gauge a market wage without using some type of external comparison. While several recent studies have argued that the dramatic increase in CEO pay is tied to changing labor market conditions (e.g., Himmelberg and Hubbard, 2000; Murphy and Zabojnik, 2004; Frydman, 2006; Gabaix and Landier,

2008; Baranchuk, MacDonald, and Wang, 2007), none of these studies examines the use of benchmarking. An interesting question for future research is whether more economically efficient ways exist to gather information about market wages and how to use this information to set pay.

Appendix

We examine proxy statements for the 50 largest and 50 smallest firms on S&P 500 as of 1996. The comments below are excerpts from the "Report on Executive Compensation" from the 1997 proxy statements for eight of these companies. Proxy statements were obtained from Lexis-Nexis.

Russell Corp.: "The Company's practice is to target base salaries for executives at the 50th percentile of the market. For salary comparison purposes, the 'market' includes companies in the Company's industry, in similar industries and those with headquarters in smaller cities. The companies used for this market analysis of compensation are different than those included in the Value Line Apparel Index shown in the performance graph contained in this Proxy Statement…. During 1996, the Committee continued the program to increase executive salaries to market levels, over time. The Committee concluded this program was appropriate based upon a 1995 study of pay conducted by an independent consulting firm…. Target (bonus) awards for executive officers are based upon the median of the competitive market…. In making [long-term incentive awards], the Committee's intent was to make awards that were competitive with the market on an annualized basis. For this reason, the Committee did not consider existing stock holdings of executives, or prior grants, in deciding the number of stock options or performance units to grant to an executive officer…. Mr. Adams' (CEO) salary increase of $30,000 from 1995 to 1996 was intended to move him closer to the market median amount."

Ball Corp.: "Total compensation … is determined after reviewing the executive's performance and the pay of similarly situated executives at other manufacturing firms of similar size (based upon total employment and sales), capital structure, customer base, market orientation and employee demographics. Companies chosen for this comparison are the same as those included in the peer group for purposes of the performance graph. …. The Committee generally intends that target total annual compensation, defined as the sum of base salary and incentive compensation at target, for each of the Corporation's executive officers will approximate the 50th percentile of what comparable companies are paying."

Scientific-Atlanta: "At the beginning of fiscal year 1997, Mr. McDonald's (CEO) base salary was increased by five percent to maintain a position near the median for Chief Executive Officers of similarly-situated high technology companies. This increase was also consistent with national trends in executive salaries…. During fiscal 1997, Mr. McDonald was granted an annual stock option of 100,000 shares. This was near the median of grants to Chief Executive Officers by other comparable high technology companies. He also received two option grants, totaling 250,000 shares, which vest early based on attainment of performance criteria. The objective of the special grants was to position Mr. McDonald more appropriately against competitive practices in the high-technology industry, provide a direct incentive to increase Scientific-Atlanta's stock price and to provide an additional incentive for Mr. McDonald to remain with Scientific-Atlanta."

Philip Morris: "[T]otal compensation is targeted for the upper, or fourth, quartile of compensation paid to executives of the Peer Group when Company performance exceeds the median of the Peer Group. When Company performance is at or near the median of the Peer Group, total compensation is targeted at or near the median of the Peer Group…. In 1996, the Committee targeted its stock option award guidelines at the 65th percentile of the Peer Group…. The Peer Group consists of …. companies selected on the basis of size, complexity and return to stockholders."

Coca-Cola Co.: "The Committee's goal in setting base salary compensation is to be in the 50th percentile to 75th percentile base salary levels of consumer products companies of comparable size, using data from its independent compensation consultants. These companies are representative of the consumer products industry generally and are therefore broader than the peer group of publicly traded soft drink companies used for comparison of five-year cumulative return in this proxy statement. …[P]otential (bonus) awards range from 6% to 115% of salary."

People's Energy: "The Committee evaluates the competitiveness of the Company's elected officer salaries in light of competitive market data for comparable companies, primarily gas distribution companies having revenues of similar size to those of the Company. Officer salaries are established by reference to salary range midpoints that are set slightly above the average for the comparison companies…. For fiscal 1996, the Board accepted the Committee's recommendation and approved a base salary increase for Mr. Terry (CEO) of $18,200. The Committee's recommendation was based on the need to maintain the market competitiveness of Mr. Terry's base salary."

Intergraph: "The Chairman and Chief Executive Officer (CEO) subjectively determines the compensation of all other Executive officers of the Company based on the authority and discretion granted him by the Board of Directors. There are no standard performance factors, either corporate or directly applicable to the executive whose salary is being considered, that serve as specific

measures of performance in the CEO's determination of executive salaries…. The CEO has a general awareness of industry compensation practices by virtue of his experience and position in the industry, but specific industry or competitor compensation data (including that of the peer group of companies in the performance graph following this report) is not utilized…. The compensation of the Chairman and CEO is determined by the other members of the Board of Directors. Since 1989, the Board has not deliberated the compensation of the CEO, and the CEO has not been awarded a salary increase or bonus. There are no standard corporate or individual performance factors utilized by the Board in evaluation of CEO compensation. The Board believes that, because of Mr. Meadlock's large beneficial holding of Company stock, the interests of Mr. Meadlock are aligned with those of the Company's other shareholders, making salary less a factor than return on common stock in evaluation of CEO compensation."

Wal-Mart: "Base Salary: Base salaries of Company executives are based on Wal-Mart's performance for the prior fiscal year and upon a subjective evaluation of each executive's contribution to that performance. In evaluating overall Company performance, the primary focus is on Wal-Mart's financial performance for the year as measured by net income, total sales, comparable store sales and return on shareholders' equity. Other criteria, including whether Wal-Mart conducts its operations in accordance with the business and social standards expected of it by its associates, shareholders and the communities in which it operates, are also considered. Equity Participation: Stock options are generally granted annually in an effort to link each executive's future compensation to the long-term financial success of Wal-Mart, as measured by stock performance."

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