# Benchmarking of Pay Components in CEO Compensation Design

by

Yaniv Grinstein, Beni Lauterbach and Revital Yosef***

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*  Arison School of Business, Interdisciplinary Center (IDC), 8 Ha'universita Street Herzliya 4610101, ISRAEL, and Johnson Graduate School of Management, Cornell University, Sage Hall, Ithaca, New-York 14853, USA, and ECGI. E-mail: grinstein@idc.ac.il
** School of Business Administration, Bar-Ilan University,Ramat Gan 52900, ISRAEL, and ECGI. E-mail: beni.lauterbach@biu.ac.il
*** School of Business Administration, Bar-Ilan University, Ramat Gan 52900, ISRAEL. E-mail: revital110@gmail.com

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## Abstract

We examine CEO compensation benchmarking using a relatively large ultimate sample of 4,892 firm-year observations (and 70,347 peer-year observations) on 1,251 unique firms included in the S&P Composite 1500 during 2007-2013. We offer three novel observations. First, benchmarking is used not only with respect to pay levels, but also with respect to pay structure (the weights of each pay component in total compensation). Second, the benchmarking process of various pay components appears similar; the only exception is the salary component which adjusts more mildly. Last, we show that CEO's pay depends also on the current year update in peers' pay.

# 1. Introduction

In recent decades, senior executives' compensation has drawn intense academic and non-academic debate. One issue in this debate is the methodology that boards of directors and compensation committees employ when determining chief executive officer (CEO) pay. In this study we focus on the practice of compensation benchmarking. According to this practice firms compare a CEO's compensation with the compensation packages of peer CEOs at comparable companies. Previous empirical research (Albuquerque, De Franco, and Verdi, 2013; Bizjak, Lemmon, and Nguyen, 2011; Bizjak, Lemmon, and Naveen, 2008; Faulkender and Yang, 2010; Laschever, 2013) establishes that peers' pay and benchmarking play an important role in CEO's pay determination.

We extend benchmarking research to the components of CEO pay. Using a relatively large ultimate sample of 4,892 firm-year observations (and 70,347 peer-year observations) on 1,251 unique firms included in the S&P Composite 1500 during 2007-2013, we make several contributions to existing knowledge. First and foremost, we show that benchmarking is used not only when determining CEO total pay level, but also when designing the structure of CEO pay, i.e., the mix between the various components of pay. Our results demonstrate that pay components are benchmarked in a different way than total pay. Boards pay attention to the proportion of each pay component in total pay, and correct CEO's pay so that it closes about half of the previous-year gap in the weight of the pay component between the CEO and the peer group.

Second, in our analyses of the various pay components (salary, bonuses, non-equity performance pay, stock and option awards) as well as some common pay

aggregates (equity pay and non-equity performance pay), we find that the adjustments of CEO salary to that of selected peers are significantly milder than the adjustments of other pay components (non-equity performance pay and equity pay). We also identify some economically large yet statistically insignificant variations in the magnitude of the adjustments to peers between equity pay and non-equity performance pay.

Last, this study introduces a model of CEO pay that incorporates both lagged and contemporaneous economic determinates of pay. We show that changes in CEO pay are also affected by the current year change in peer firms' pay, and not only by CEO's pay relative to peers' pay in the previous year (the common practice in previous studies). The contemporaneous effect may be a result of employing compensation consultants who are already aware of at least trends in current year's compensation revisions in other firms.

In sum, we find that CEO's pay benchmarking depends on three elements: 1) the ratio of CEO's pay to peers' pay in the previous year; 2) the current year change in peer firms' pay; and 3) the misalignment of pay structure, i.e., the difference between the weight of a certain pay component in total CEO pay and the corresponding median weight of that pay component among the chosen peers.

The rest of the paper is organized as follows. Section 2 presents a literature review and outlines our hypotheses. Section 3 describes the data and the sample selection process. Section 4 outlines our basic model of the level of CEO pay components. Section 5 reports and discusses the benchmarking tests' results, and Section 6 summarizes.

## 2. The Benchmarking Practice

### 2.1. Background

A common practice in CEOs' pay-setting process is comparison of their pay with peer groups' pay. The set of peer firms is selected by the directors and the compensation committee members who often engage external compensation consultants. Outside the firm, proxy advisors also use peers' compensation as their benchmark when evaluating senior executives' pay plans. According to the benchmarking method, the current level and composition of firm CEO's compensation is compared to that of a peer group of CEOs at similar firms, where "similar" is typically based on industry, size and talent flow considerations (past sources and destinations of firm's executives). In such analyses, pay below the median is usually considered "below market".

To further enable transparency, in 2006, the Securities and Exchange Commission (SEC) adopted new proxy disclosure rules that require firms to report all the companies in the peer group or survey, as long as the use of peer groups has a material impact on executive compensation. The disclosure must include the names of the individual companies and a detailed explanation on why these companies were selected as peers. The SEC's 2006 disclosure requirements enable researchers to examine the impact of actual peer group pay on the level of CEO compensation.

Existing studies show that the median CEO total pay in the peer group helps explain CEO pay. Furthermore, the impact of peer CEO median pay on firm CEO pay exceeds that of stock market performance (e.g., Faulkender and Yang, 2010; Bizjak et al., 2011; Albuquerque et al., 2013)[1].

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[1] A growing strand of literature provides evidence on the role and the effect of peer firms beyond compensation benchmarking. Peer selection also affects relative performance awards (RPE) - see, for example, Bizjak, Kalpathy, Li and Young (2019) , De Anglies and Grinstein (2019), and Ma, Shin and

## 2.2. The debate over the virtue of benchmarking

The purpose of the benchmarking method is to adjust the level and composition of executive compensation. A senior executive who is compensated improperly may potentially resign from the company or neglect her duties. In order to retain valuable human capital, the company should follow the market compensation standards. The benchmarking of CEO compensation is a practical and efficient mechanism to gauge the market wage (Holmstrom and Kaplan, 2003).

The main concern is that benchmarking will serve to justify pay raises that are independent of CEO or firm performance. Critics of the use of peer group benchmarking argue that powerful CEOs opportunistically choose peer firms in a way that inflates their pay (Iii, Main, and Crystal, 1988; Main, O'Reilly, and Wade, 1995; Newman and Mozes, 1999). Faulkender and Yang (2010) show that the level of CEO compensation at a potential peer company affects its likelihood of being chosen as a compensation peer. This effect is particularly strong in firms where the peer group is smaller, where the CEO is the chairman of the board of directors, where the CEO has longer tenure, and where directors are busier serving on multiple boards. Similarly, Bizjak et al. (2011) and Laschever (2013) show that when firms deviate from the economic model of peer firm choice, they tend to pick larger firms and firms with higher CEO pay. These biases in peer group selection are more evident in smaller, less visible firms where arguably management has more discretion in selecting the peer group. Last, Hayes and Schaefer (2009) provide an interesting explanation for picking highly paid peers. They develop a game-theoretic model of the "Lake Wobegon Effect", and show

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Wang (2019). Peer groups also play an important role in other corporate policies such as corporate investment, corporate capital structure and financial policies (e.g., Foucault and Fresard, 2014; Leary and Roberts, 2014).

that boards may rationally inflate CEO pay to influence market perception regarding the quality of management and value of the firm.

The debate about benchmarking is ongoing. Cadman and Carter (2014) do not find evidence for opportunistic selection of peers, while Larcker, McClure and Zhu (2019) estimate that in a third of their firm-year observations, peers were selected opportunistically. Albuquerque et al. (2013) find that the CEO talent component of pay (approximated based on past abnormal performance, the size of the firms the CEO has managed in the past, and media coverage) is from two to ten times larger than the self-serving component of pay (captured by board structure, antitakeover provisions, and ownership concentration). Last, in line with the "competition for managerial talent" view, Cremers and Grinstein (2014) report that benchmarking practice is prevalent primarily in industries in which new CEOs tend to come from outside the firm. In contrast, there is no evidence for benchmarking in industries with few outside CEOs.

Recent addition to the literature suggest that the benchmarking method may also serve as a motivational tool. Francis, Hasan, Mani and Ye (2016) find that firms with relatively high peer quality (in terms of managerial skills) exhibit superior performance over firms with relatively poor peer quality. Following a more skilled peer group could improve firm performance in two ways: CEOs may be motivated by these peers to increase work efforts, and/or CEOs may learn from these peers' policies. In this study we aim at developing this motivational line of thought. We propose that each component of pay may have its own motivational purpose. Thus, benchmarking of pay structure (the weight of each component in total pay) may balance the different incentive effects of the various pay components in a prudent way.

**2.3. Existing evidence on benchmarking CEO's total pay**

Benchmarking of total pay has been extensively studied in prior research. Bizjak et al. (2008) document that the use of peer groups is widespread. Ninety-six firms of a random sample of 100 firms listed in the S&P500 index, reported that peer groups had been used in determining compensation. Further, seventy-three firms mentioned targeting one or more of the components of pay at either the median or mean of the peer group. Bizjak et al. (2008) also 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 higher than the raises received by their counterparts whose pay is above the peer group median. In each year, approximately one-third of the executives with pay below their peer group's median receive pay adjustments that move them to or above the median level of pay in their peer group. Another interesting finding is that the effect of peer group benchmarking on changes in CEO pay is stronger (more significant) than the effect of stock price performance on changes in CEO pay.

The literature reports various estimates of the sensitivity of CEO pay to peers' pay. Faulkender and Yang (2010), Albuquerque et al. (2013) and Laschever (2013) estimate (in different samples) an elasticity of CEO pay with respect to the median peer pay of 0.38 to 0.58. Bizjak et al. (2011) find that the annual increase in compensation closes about one-third of the difference in pay between the CEO and her peer group median.

**2.3. Pay components' benchmarking**

Previous studies focus on the benchmarking on CEO's total pay. However, reviewing DEF14A forms, we find that the benchmarking practice is applied on the components of total pay as well. When determining CEO's pay, many firms examine

each pay component separately by comparing it to the median value (or to a specified percentile) of this pay component among their chosen peers.

Some examples may be useful. The 3M Company states in its 2011 proxy statement that "the Committee generally aims to provide the Company's executives whose performance meets the Company's expectations with Total Cash Compensation that is at or very close to the median of the corresponding compensation paid to executives in the benchmarking groups, and with long-term incentive compensation delivered through annual grants having values that are close to the average of the 50th and 75th percentiles of the corresponding grant values provided to executives in the benchmarking groups". Another example is the 2013 proxy statement of Align Technology where the company disclosed a target for base salary (50th percentile), a target for total cash compensation (65th to 75th percentile) and a target for equity compensation (50th to 75th percentile).

Based on the examples above, we propose that each of the CEO pay components has its unique character, purpose and behavior. Thus, each of the pay components may be benchmarked separately and perhaps differently. CEO compensation packages comprise six main components of pay: 1) base salary, 2) bonuses, 3) non-equity incentive compensation, 4) option grants, 5) restricted stock grants, and 6) other pay. In our hypotheses and empirical tests we will consider each of them separately. Notably, in some of our key empirical tests we divide total compensation into just three components that appear to us more distinctive: salary, non-equity performance pay (bonuses and non-equity incentive compensation), and equity pay (restricted stock and option grants). Such a division may maximize the potential differences between pay components.

2.3.1. Benchmarking the level of the pay component

Our basic hypothesis is

**Hypothesis 1:** When the level of CEOs' pay component X deviates from the norms at their peer firms in year t-1, CEOs will incur an "adjustment towards the peers" pay correction in their year t pay component X.

Hypothesis 1 is intended to examine the previously untested prediction that pay components are also benchmarked. Furthermore, it is interesting and we will also examine whether or not all components of pay are benchmarked to the same extent (i.e., using the same adjustment parameters).

Our second pay level hypothesis relates to the observation that boards and compensation committees typically hire a compensation consulting firm to help them design CEO's and other senior executives' compensation packages. It is likely that when designing a pay package, the consulting firms rely not only on benchmarking to the past disclosed pay of CEOs in peer firms, but also consider the anticipated pay levels and current year pay trends among firm's peers. Information on current compensation levels at peer firms can also leak via directors who serve on multiple boards (e.g. Cai and Sevillir, 2012; Cheng, Felix and Zhao, 2019). Thus, unlike previous studies that implicitly assume that firm boards and compensation committees lack information about current compensation levels at peer firms, we propose

**Hypothesis 2:** The adjustments of the level of pay component X is also affected by the current year change in the level of pay component X at the selected peers.

Hypothesis 2 is new, and it may be especially relevant in recent years. As information availability and data analysis capabilities increase, the speed of adjustment increases. Thus, current year pay change at peers firms affects the contemporaneous CEO pay.

2.3.2. Benchmarking of the pay mix

Our second focus regards pay structure or pay mix. We hypothesize that benchmarking is employed also with regards to the structure of CEO pay. Prior studies demonstrate the importance of well-designed pay structure. Mehran (1995) argues that the structure rather than the level of pay is what motivates managers to increase firm value. He finds that firm performance is positively related to the percentage of executive compensation that is equity-based. Perry and Zenner (2001) examine the effects of U.S regulatory changes in CEO compensation in 1992-1993 on the structure of CEO pay and find that changes to pay structure strengthen the relationship between pay and performance. Choe, Tian and Yin (2014) examine the main implications of the "managerial power" theory on the relation between CEO power and the structure of CEO pay. They argue that the ratio of salary to total compensation increases in CEO power.

The structure of CEO compensation has changed considerably over time. Pay mix changes probably reflect 1) increases in firm size and business complexity that perhaps increase potential agency problems; 2) a better understanding over time of what attracts, motivates and retains CEOs; and 3) regulatory changes.

Until the late 1970s salaries and bonuses were the dominant components of CEO pay. One of the major shifts in CEO pay structure occurred in the 1990s with the surge in stock option grants. This follows section 162(m) of the Internal Revenue Code (IRC) in 1994 that places a one million dollar cap on the amount of deductible non-performance compensation. Stock options have become the largest component of CEO pay (accounting for more than a half of total compensation), whereas base salary as a percentage of total pay has decreased substantially (Conyon and Murphy, 2000). This pay mix change can also be explained by the shareholder pressure for equity-based pay,

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i.e., the understanding that CEOs' agency problems can be mitigated via reinforcing the ties between CEO and shareholder interests (Jensen and Murphy, 1990).

The second important change in the structure of CEO pay occurred in the mid-2000s when restricted stocks have gradually replaced stock option grants. By 2006 restricted stock grants have become the most popular form of equity compensation for CEOs in large U.S firms. One of the reasons for preferring restricted stock over stock options is the "steroid" nature of stock options that led senior management to pursue short-run profits at the expense of long-run value. Another rationale for preferring restricted stock can be explained by changes in accounting rules. In December 2004, FASB announced FAS123R that requires all U.S. firms to recognize an accounting expense when granting stock options. Stock options that have long been viewed as essentially free or at least inexpensive to grant become unattractive following FAS123R that equates the expense for stock options to that of shares of stock.

This study is the first to examine whether benchmarking is used with respect to the structure of CEO pay. Previous studies research only the benchmarking of CEO's pay level. Our novel proposition is that boards try to grant their CEOs comparable pay structures as well. Pay structures are important because they determine the relative strength of the various incentives provided by the different components of total pay. Suppose, for example, that equity pay is intended to boost CEO's attention to firm's stock price, while non-equity performance pay is intended to enhance CEO's efforts in other areas such as long-term efficiency and survival. In such a case, the balance between equity and non-equity performance pay in CEO's compensation plan signals to the CEO the relative importance of pursuing a high stock price. Boards and compensation consultants probably discuss the optimal balance between different pay components, and one of the solutions is to imitate the pay structure of peer firms.

Admittedly, it is not straightforward to assume that pay structure is benchmarked. It can be argued that different companies should design a mix of compensation components that best suits their own needs and strategy and their specific CEO characteristics (such as age, equity holdings and more). Nevertheless, learning from similar firms, the peer firms, may provide insights into the optimal compensation structure choices of the firm. Thus, to the extent that peer firms are truly comparable firms, or even successful comparable firms, pay structure benchmarking may be prudent. Since firms are generally assisted by outside compensation experts we believe that peer selection is adequate and "learning" from the selected peers' pay design, including peers' pay mix, is relevant for the firm.

Now, if benchmarking is employed also with respect to a pay component's share in total CEO pay, we propose

**Hypothesis 3:** Benchmarking of the pay structure affects CEO pay components; CEOs whose share of pay component X in total compensation is below (above) the peer group median in year t-1, will receive an upward (downward) adjustment in the level of pay component X in year t.

## 3. Sample and Data

### 3.1. Sample selection

The initial sample comprises 10,481 firm-year observations on S&P Composite 1500 index firms during 2007-2013. (The S&P Composite 1500 combines three indices: the S&P 500, the S&P MidCap 400 and the S&P SmallCap 600.) In December 2006, the SEC introduced new amendments that require firms to disclose their peer group as long as the use of peer group is material in the pay setting process. Hence, peer group data have become available in definitive proxy statements (DEF14A) for fiscal

year 2006. To avoid issues related to the first year implementation of regulations, the first year of the sample is set to 2007.

We focus on executives classified as CEOs by Standard & Poor's ExecuComp database. Compensation data is obtained from three databases: 1) ExecuComp database; 2) Morningstar Executive Insight Data; and 3) ExecComp Analytics (ECA) database provided by Institutional Shareholder Services (ISS). Combining compensation data from three different databases is designed to create a comprehensive and unbiased sample. Priority is given to the ExecuComp database, the most common database used in academic research.

We exclude 93 firm-year observations with no available compensation data for the current and/or previous year, and 35 observations of zero values for total compensation. Pay components observations with negative values are defined as missing values. We further drop 2,000 observations of CEOs who were replaced or appointed during the current or previous year to avoid partial compensation or exceptional high payments (e.g., golden parachutes, severance pay, golden handshakes and sign-on bonuses). This reduces sample size to 8,353 firm-year observations.

For each of the 8,353 firm-years, we find the disclosed list of compensation peers. We assemble this information from two sources. Peer information for years 2007 and 2008 is based on manually collected data from the Compensation Discussion and Analysis (CD&A) section of the proxy statements.[2] These data are described in Albuquerque, De Franco and Verdi (2013). We construct peer lists for 1,639 firm-year observations based on Albuquerque, De Franco and Verdi (2013)'s dataset.

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[2] We are grateful to Ana Albuquerque and her co-authors for providing these data to us.

Peer data for 2008-2013 are collected from the ECA database provided by ISS. We construct peer lists for 4,884 firm-year observations from ECA database. In total we build an explicit list of peers for 6,523 firm-years, 78% of our initial list. The remaining 22% firm-year observations belong to firms that use an index or a survey to benchmark their executive pay or do not use peers to set executive pay (Albuquerque, De Franco and Verdi, 2013; Cadman and Carter, 2014).

Next, given our list of peer CEOs, we seek current and prior year compensation data for 112,328 firm-year peer observations. (Thus, there were on average more than 17 peers for each CEO.) We find available compensation data for 98,432 firm-year peer observations (peer-year observations, in short). It is worth noting that some of the peers are foreign or private firms, and thus do not appear in Execucomp or ECA databases.

Given available peer and peer compensation data, we exclude 33 disclosing firm-years that report only one or two peers. Further, we exclude 396 firm-years with missing compensation data for 50% or more of their disclosed peers.[3]

Last, we exclude 34 observations of Co-CEOs and 1,168 observations of firms in the financial services industry (industries between 45 and 48, as defined in the Fama and French industry classification). Table 1 summarizes the sample selection process as described above. The final sample comprises 4,892 firm-year observations, representing 1,251 unique disclosing firms.

[Insert Table 1 about here]

We collect data on pay targets from the ECA database when available. For each disclosing firm and compensation component, we calculate the target pay level based on peers' compensation data and the target pay percentile set by firm's board. In cases

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[3] Peer CEOs' pay is marked as missing also in years when the peer CEO was replaced or appointed.

where the target is expressed as a range (for example, 50-60%) of peers' pay, we use the middle of the target range (55%). Non-median targets are relatively scarce. In about 12% of the firm years in our final sample (589 out of the 4,892 firm-years) there are non-median pay targets. Notably, there are 3,108 firm-years that do not disclose any specific pay target. We assume that the pay target in these 3,108 firm-years is the median of the peer group. Notably, when examining benchmarking of the CEO pay structure, we assume that the benchmark for the weight of pay component X in total compensation is its median proportion among the peers.

We use two procedures to mitigate the potential effect of outliers in the highly skewed compensation data. First, as common in the compensation literature, all compensation data are winsorized at the 2.5% and 97.5% levels within each year. When examining year-to-year changes in CEO pay, we winsorize the percentage change in pay rather than the level of pay. Second, the empirical analysis uses the logarithm of the pay measures and the logarithmic change of pay. This logarithmic transformation is common in and facilitates comparison with previous studies.

Stock return data are from the Center for Research in Security Prices (CRSP) data base. Other financial data (i.e., sales, ROA, market to book ratio and financial leverage) that have been found to explain variations in CEO pay in previous research are extracted from Standard & Poor's Compustat database. Data on CEO's name, age and dual role as CEO and Chairman of the board are collected from the Execucomp database.

**3.2. Descriptive statistics**

Our final sample comprises 4,892 firm-year CEO pay observations in S&P 1500 firms during 2007-2013. These observations are distributed almost uniformly across the sample years. Every firm-year observation includes also information about the peers.

The average (median) peer group for our sample firms includes about 18 (16) firms, and deducting missing peer compensation data, the average (median) number of peers with available compensation data per firm is 14 (13). (The final sample includes 70,347 peer-year observations.) The average and median numbers of peers is consistent with prior studies (e.g. Faulkender and Yang, 2012; Albuquerque, Franco and Verdi, 2013).

Table 2 offers extensive descriptive statistics of CEO's annual pay, change in annual pay and pay structure, all compared to peer firms' CEOs. Panel A of Table 2 focuses on the pay levels at our disclosing firms (denoted, for brevity, firms, hereafter). The average (median) annual CEO total compensation is 6,964 (5,260) thousand dollars. The mean (median) sum of salary and discretionary bonus is $994 ($850) thousands, which is very close to the one million dollars cap on deductible compensation. The average (median) stock awards of $2,343 ($1,500) thousands is almost double the average (median) annual level of option awards. The mean non-equity incentive compensation is $1,296 thousands. The "other pay" component, which is the sum of the change in pension value, non-qualified deferred compensation earnings, and all other compensation, is shown for completeness, and its mean is $752 thousands.

Target pay measures based on previous year data of disclosed peers are presented to the right of the CEO pay statistics. Target pay statistics resemble those of the actual CEO pay. For example, the average (median) of the target total compensation is $6,853 ($5,617) thousands, while the average (median) total compensation of CEOs is $6,964 ($5,260) thousands.

Panel B provides descriptive statistics for various pay change measures, estimated as the first difference in Ln(pay). The variation in the number of observations is because we exclude from the analysis cases in which the pay component takes the value of zero

in either the current or previous year. The average (median) yearly change in total compensation over the sample period is 8.5% (7.1%), and it is largely due to an average (median) increase of 9.6% (7.1%) in equity pay that comprises option and stock awards. Other pay components such as salary, bonuses and non-equity incentive compensation increase on average at an annual rate of 4% over the sample period.

Changes in pay targets based on peer group data are reported on the right side of Panel B. The average change in the total compensation target is 5.8%, smaller than the corresponding 8.5% average increase in total compensation among disclosing firms. However, differences between the medians are milder, especially when we compare the components of pay. Another lesson can be learnt from the mean negative change of 3.9% in the peers' "other pay". This finding warns us that "other pay" appears to be a residual term, erratic and perhaps less well-controlled. In the main analysis of this study we'll ignore it.

Panel C presents descriptive statistics on the compensation structure. Pay components are reported as a percentage of total compensation. Note that median ratios do not sum to 100% (because the sum of the medians is not the median of the sum). Also, the sum of the mean ratios in Panel A of table 5 are lower by 3 percentage points than 100% because pay components are positively skewed and each pay measure is winsorized at the 2.5% and 97.5% levels.

On average, nearly 19% of CEO's total compensation is in salary, 2% in bonuses, 19% in non-equity incentive compensation, 31% in stock awards, 17% in option awards, and 9% in "other pay". These statistics show that U.S CEOs receive most of their pay in the form of performance-based compensation. The right side of Panel C reports statistics about the target ratios of various pay measures to total compensation,

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based on peers' compensation data. The compensation structure of the sample firms is similar to that of the peer firms.

[Insert Table 2 about here]

Table 3 documents summary statistics for characteristics that are common in the CEO compensation literature. (Typically lagged values of this variable are employed.) The mean (median) annual stock return is 15% (12%). The sample period includes both the Great Global Recession (years with negative stock returns) and the following years of recovery. The mean and the median return on assets (ROA) is 0.05. We employ firm's annual sales revenue as our proxy for firm's size. The average sales is $8,510 million, almost four times the median sales of $2,242 million. As usual, the distribution of firm sales is skewed towards large values. The average firm risk, represented by the standard deviation of monthly stock returns in the thirty-six months preceding the end of the current fiscal year, has a mean (median) of 0.11 (0.10). The market to book (MTB) ratio, a measure of firm's growth opportunities, is defined as the ratio of the market value of equity to the book value of equity at the end of year t-1. The mean (median) MTB is 1.80 (1.48). Financial leverage is measured as book value of total liabilities divided by the sum of the book value of total liabilities and the market value of equity. Leverage has a mean (median) of 0.36 (0.33). CEO age is a proxy of CEO's work experience. The average CEO age is 56 years. The youngest CEO is 29 years old, while the oldest is 93. Last, only 16% of the CEOs in the sample serve also as Chairman of the board.

[Insert Table 3 about here]

## 4. Evidence on the Determinants of CEO Pay and its Components

The conventional specifications of existing models of CEO total compensation (Albuquerque et al., 2013; Bizjak et al., 2008; Faulkender and Yang, 2012, 2010; Laschever, 2013) is

$$(1)\ \text{Ln}\big(\text{CEO compensation}_{i,t}\big)$$
$$= \alpha_0 + \alpha_1 \text{Ln}\big(\text{Sales}_{i,t-1}\big) + \alpha_2\big(\text{Stock return}_{i,t}\big) + \alpha_3\big(\text{Stock return}_{i,t-1}\big)$$
$$+ \alpha_4\big(\text{ROA}_{i,t}\big) + \alpha_5\big(\text{ROA}_{i,t-1}\big) + \alpha_6 \text{Ln}\big(\text{Risk}_{i,t-1}\big) + \alpha_7\big(\text{MTB}_{i,t-1}\big)$$
$$+ \alpha_8\big(\text{Leverage}_{i,t-1}\big) + \alpha_9\big(\text{CEO Age}_{i,t}\big) + \alpha_{10}\big(\text{CEO Duality Dum}_{i,t}\big)$$
$$+ \alpha_{11}(\text{IndustryDum}_{i,t}) \times (\text{YearDum}_t) + e_{i,t}\ ,$$

where i indexes firms and t indexes time. We fit an analogous model for the following six different pay components: 1) salary; 2) performance pay - the sum of bonus, option awards, stock awards and non-equity incentive compensation; 3) non-equity performance pay – the sum of bonus and non-equity incentive compensation; 4) equity pay - the sum of option awards and stock awards; 5) stock awards; and 6) option awards.

The explanatory variables in equation (1) include the following firm and CEO characteristics: the natural logarithm of sales in previous year (a measure of firm size); stock returns and returns on assets (ROA) in years t and t-1 (firm's performance indicators); the natural logarithm of the standard deviation of the monthly stock return in the thirty-six months preceding the end of the previous fiscal year (represents firm's risk); market to book (MTB) ratio (a proxy for firm's growth opportunities); leverage; CEO age; and CEO duality (a dummy variable that equals 1 when the CEO serves also as the Chairman). We further include dummy variables for each unique combination of industry and year. Industry classification is based on Fama and French (1997) 49 industry classification. Finally, the residual $e_{it}$ is a firm-year specific error term that is

assumed to be correlated within firms and heteroskedastic. As such, we cluster standard errors at the firm level to control for serial correlation.

Executive compensation literature assumes conservatively that boards and compensation committees do not have contemporaneous (year t) information on most of the pay factors outlined in the previous section. This is because compensation policy and objectives are formed at the beginning of each financial year. The only exception is firm performance, which is assumed to have both lagged and contemporaneous effect on CEO compensation. In this study, we allow CEO compensation to depend on both the lagged and contemporaneous levels of the commonly used explanatory variables. This is because expectations regarding these variables exist at the beginning of the year, and because at the end of the year, when ex-post pay adjustments are made, the levels of these pay determinants are largely known. Accordingly, we employ the following elaborated model of the level of CEO compensation:

$$(2)\ \mathrm{Ln}\big(\text{CEO compensation}_{i,t}\big)$$

$$= \alpha_0 + \alpha_1\mathrm{Ln}\big(\text{Sales}_{i,t-1}\big) + \alpha_2\mathrm{Ln}\big(\text{Sales}_{i,t}\big) + \alpha_3\big(\text{Stock return}_{i,t}\big)$$

$$+ \alpha_4\big(\text{Stock return}_{i,t-1}\big) + \alpha_5\big(\text{ROA}_{i,t}\big) + \alpha_6\big(\text{ROA}_{i,t-1}\big) + \alpha_7\mathrm{Ln}\big(\text{Risk}_{i,t-1}\big)$$

$$+ \alpha_8\mathrm{Ln}\big(\text{Risk}_{i,t}\big) + \alpha_9\big(\text{MTB}_{i,t-1}\big) + \alpha_{10}\big(\text{MTB}_{i,t}\big) + \alpha_{11}\big(\text{Leverage}_{i,t-1}\big)$$

$$+ \alpha_{12}\big(\text{Leverage}_{i,t}\big) + \alpha_{13}\big(\text{CEO Age}_{i,t}\big) + \alpha_{14}\big(\text{CEO Duality Dum}_{i,t}\big)$$

$$+ \alpha_{15}\big(\text{IndustryDum}_{i,t}\big) \times \big(\text{YearDum}_t\big) + e_{i,t}\,,$$

where in addition to the variables specified in equation (1), we add the current year measures of firm size, risk, market to book and leverage ratios. To overcome multicollinearity between the contemporaneous and lagged variables, we first regress the contemporaneous (year t) level of each of the above-mentioned economic determinants on its lagged (year t-1) value. Then, we use the residuals of these

regressions as explanatory variables in the pay level regression (equation 2). As before, the residual $e_{it}$ is a firm-year specific error term that is assumed to be correlated within firms and heteroskedastic.

Table 4 reports the results of estimating equation (2) for total pay and for six different pay components, as described above. All seven regressions are statistically significant at the 1% level at least, and their adjusted R-squares range from 0.39 to 0.62. Consistent with existing evidence on the relation between CEO compensation and firm size (Tosi, Werner, Katz and Gomez-Mejia, 2000; Gabaix, Landier and Sauvagnat, 2014; Edmans, Gabaix and Jenter, 2017), the coefficient of Ln (Sales$_{i,t-1}$) and its lagged value are positive and highly significant for all compensation components. The positive coefficient of firm size most probably indicates that the managerial talent and skills needed for running larger and more complex firms are scarce and command a higher compensation.

The coefficients of stock return and lagged stock return are positive and statistically significant for all pay components, except for salary. This illustrates that CEO is rewarded (punished) for good (poor) stock performance. The pay performance relation is documented and widely studied in previous research - see Edmans et al. (2017). However, the relation between CEO compensation and accounting performance is unstable and somewhat confusing, as current and lagged ROA coefficients are in general of opposite sign. Among pay components, only the total elasticity of non-equity incentive pay to ROA (the sum of the coefficients of ROA and one-year lagged ROA) is positive on average, perhaps because non-equity incentive pay is typically linked to an accounting performance metric. Negative or almost no effect of ROA on CEO pay is also documented in previous literature (e.g., Faulkender and Yang, 2010, 2012; Laschever, 2013).

According to the principal-agent theory, riskier firms have to pay more than less risky firms to induce their CEOs to exert more efforts to maximize firm value, and also to compensate them for the greater wealth uncertainty (Cheng, Hong and Scheinkman, 2015). Inconsistent with this prediction, we find a negative relation between firm's risk and CEO pay. Such a negative relation appears in some previous studies - see Cohen and Lauterbach (2008) and Faulkender and Yang (2012), for example. Albuqueque, Albuquerque, Carter and Dong (2019) recently examine the tricky relation between compensation and risk and conclude that the additional pay of CEOs with riskier pay packages appears to be economically small.

The coefficient on the lagged market to book ratio is significantly positive for both equity pay and option awards, and negative, yet insignificant for base salary. Firms with greater growth opportunities derive a large proportion of their value from future investments than from existing assets. Generally, it is more difficult to monitor CEOs in high growth firms, who make uncertain future investment decisions. Hence, those firms appear to use more equity-based compensation to incentivize their CEOs to exert efforts and make investment decisions that would maximize firm value.

As for the other explanatory factors, lagged leverage has a negative and significant effect on equity pay, suggesting that banks and institutional monitoring cuts equity pay. CEO age has a significant influence on salary and non-equity performance pay. It implies that work experience and perhaps the ability of older and entrenched CEOs to overpay themselves are mainly embedded in fixed- and accounting-based performance pay. Consistent with previous studies (e.g., Faulkender and Yang, 2010, 2012), we find that CEOs who serve also as Chairman of the board receive higher pay.

Among pay components, base salary appears most distinct. CEO's base salary is significantly affected only by firm size and the CEO-Chairman duality - the coefficients

on the other explanatory variables are either insignificant or have no effect on the salary component. In addition, salary is characterized by only slight year to year changes possibly due to the fact that salary is a "certain" component of pay or the one-million-dollar cap of section 162(m).

[Insert Table 4 about here]

Overall, the results are consistent with findings of earlier studies of total compensation. We further find some variations in the explanatory power of various factors across pay components. Salary, equity pay and no-equity performance pay show some distinctive behaviors. Thus, examining each pay component separately, as we do in this study, should provide a more accurate picture of the component behavior.

We can also summarize the effects of elaborating the compensation equation to include current (year t) data other than stock return. Current year sales residual has almost the same coefficient as lagged sales across different pay measures, suggesting that changes in sales level in year t influence CEO pay similarly in terms of magnitude. Likewise, the coefficient of the contemporaneous risk residual remains negative and has almost the same size of effect. However, the significance level of the contemporaneous risk measure increase substantially for performance pay, non-equity performance pay, equity pay and stock awards. This result indicates that CEO pay is more sensitive to current year changes in firm's risk measure compared with lagged year risk measure.

For the other explanatory variables, adding the contemporaneous value appears less instructive. Current year leverage has a positive effect on all pay measures. This positive effect contrasts the significant negative effect of lagged leverage on equity pay. In addition, the coefficients of the current year market to book ratio are mostly

statistically insignificant. It is possible that leverage and market to book have on average and in general minor effects on CEO pay. Finally, we also fit the traditional compensation model of equation (1), and find that its adjusted R-squares are lower than those of the elaborated model of equation (2) and Table 4 by about 1%. Thus, the elaborated model is the baseline model in the rest of the paper.

## 5. Evidence on Benchmarking in the Level and Structure of CEO Pay

### 5.1 Univariate evidence on benchmarking in CEO compensation

The benchmarking hypothesis (Hypothesis 1) predicts that CEOs with below target-pay in year t-1 receive a pay raise in year t that is higher than the respective pay raise of CEOs who earn above-target pay in year t-1. We begin by comparing the changes in pay of CEOs who earn above and below the target pay level, where the target pay is based on peers' compensation. Panel A of Table 5 documents that the mean and median logarithmic changes in pay for CEOs who are paid below the target are higher than the respective changes in pay for CEOs who are paid above the target in the prior year. These preliminary univariate tests' results are consistent with Hypothesis 1.

Using both parametric and non-parametric tests, the pay raise gaps between the below- and above-target groups are statistically different from zero at least at the 1% level for all compensation components with no exception. We use *t*-statistics when comparing mean changes, and Wilcoxon rank sum *z*-statistics when comparing median changes. It is also noteworthy that the number of observations in the 'below target' groups is generally larger than the number of observations in the 'above target' groups. This difference is indicative of firms' tendency to select highly paid CEOs as their peers (Faulkender and Yang, 2010; Bizjak et al., 2011).

Among pay components, salary exhibits not only the lowest year to year change, but also the lowest difference between the 'below target' and 'above target' groups. For the other pay components, the mean (median) proportional pay raise gaps between below- and above-target paid CEOs range from 0.25 to 0.37 (0.07 to 0.21). Among the various pay measures examined, performance pay exhibits the widest average pay gap in percentage terms – a 25% mean increase for below-target paid CEOs versus an 11% pay cut for above-target paid CEOs. Interestingly, CEOs who earn above the peer group in the previous year receive a pay cut in the following year (the only exception is the salary component). These pay cuts in the 'above target' group appear to weaken somewhat the popular view of powerful rent-seeking CEOs.

Overall, the results in Panel A of Table 5 indicate that on average CEOs receive larger (lower) raises when their pay is below (above) their target pay, where target pay is assessed on the basis of peer-group's pay. Importantly, this result holds for all eight pay and pay components reviewed in Panel A of Table 5 also when we measure the raise in dollar terms. For example, the average (median) total pay increase of below target firms is about 1067 (513) thousand dollars, significantly higher than the average (median) total pay increase of above target firms that is about 706 (210) thousand dollars. In sum, univariate tests appear to strongly support the benchmarking of the level of pay components (Hypothesis 1).

[Insert Table 5 about here]

We next examine whether benchmarking is employed also in determining the structure of CEO pay. Each component of pay may enforce a different effort scheme from the CEO, hence an optimal pay mix is essential. Our Hypothesis 3 contends that boards turn to comparable firms to gauge the optimal composition of CEO pay.

In order to examine Hypothesis 3, we compute the average year by year changes in the weight of various pay components in total compensation for two groups: 1) CEOs whose weight of pay component X in total compensation is above the previous year peer group median; and 2) CEOs whose weight of pay component X in total compensation is below the peer group median in the previous year.

Panel B of Table 5 documents the results. The mean change in the weight of each pay measure in total compensation is positive for the "below median" group and negative for the "above median" group. Thus, as predicted by Hypothesis 3, on average, the weight of pay component X in firm i is corrected towards the peer group median weight of component X. Further, *t*-tests indicate that for all pay components, the difference between the mean weight change of above and below median firms is statistically significant at the 1% level. These results provide preliminary evidence that firms benchmark not only CEO pay levels but also CEO pay structure.

To further examine whether benchmarking affects the structure of pay, we estimate the following univariate regression:

$$(3)\ \Delta\left(\frac{\text{pay component X}}{\text{CEO total compensation}}\right)_{i,t} = \beta_0$$

$$+ \beta_1\left[\left(\frac{\text{peer pay component X}}{\text{peer total compensation}}\right)_{i,t-1} - \left(\frac{\text{pay component X}}{\text{CEO total compensation}}\right)_{i,t-1}\right]$$

$$+ \beta_2(\text{IndustryDum}_{i,t}) \times (\text{YearDum}_t) + \varepsilon_{i,t}$$

where i indexes firms and t indexes time. The dependent variable is the change in the weight of pay component X in total compensation from year t-1 to year t. The independent variable that captures benchmarking is the difference between the median weight of pay component X in peer firms' total compensation and the corresponding weight at a disclosing firm, both at year t-1. We refer to this difference as the distance

from peer group median in year t-1. If the distance from peer group median is positive (negative), the weight of pay measure X in total compensation in firm i is below (above) the corresponding peer group median. If boards try to adjust their CEOs pay structure according to peer group median structure, the coefficient $\beta_1$ in equation (3) should be positive. We further include industry-year fixed effects and cluster standard errors at the firm level.

The results, reported in Panel C of Table 5, show that the coefficients of the distance from peer group median weight in year t-1 are positive and statistically significant at 1% level at least, for all pay components. The coefficient estimates hover about 0.5, indicating that about half of the pay weight gaps are closed within a year. Evidently, pay structure corrections are not minute.

**5.2. Testing an integrated model of compensation benchmarking**

Benchmarking focuses on changes in CEO pay. Thus, we start by differencing our elaborated CEO pay model of equation (2), to obtain:

(4) $\Delta \text{Ln}\big(\text{CEO compensation component}_{i,t}\big)$

$= \beta_0 + \beta_1 \Delta \text{Ln}\big(\text{Sales}_{i,t-1}\big) + \beta_2 \Delta \text{Ln}\big(\text{Sales}_{i,t}\big) + \beta_3 \Delta\big(\text{Stock return}_{i,t}\big)$

$+ \beta_4 \Delta\big(\text{Stock return}_{i,t-1}\big) + \beta_5 \Delta\big(\text{ROA}_{i,t}\big) + \beta_6 \Delta\big(\text{ROA}_{i,t-1}\big) + \beta_7 \Delta \text{Ln}\big(\text{Risk}_{i,t-1}\big)$

$+ \beta_8 \Delta \text{Ln}\big(\text{Risk}_{i,t}\big) + \beta_9 \Delta\big(\text{MTB}_{i,t-1}\big) + \beta_{10} \Delta\big(\text{MTB}_{i,t}\big) + \beta_{11} \Delta\big(\text{Leverage}_{i,t-1}\big)$

$+ \beta_{12} \Delta\big(\text{Leverage}_{i,t}\big) + \beta_{13}\big(\text{IndustryDum}_{i,t}\big) \times \big(\text{YearDum}_t\big) + \varepsilon_{i,t}$ ,

Next, we add three benchmarking measures to equation (4). The first variable, $\text{Ln}\big(\text{Relative compensation}_{i,t-1}\big),$ is used in Bizjak et al. (2011) who define the benchmarking variable as the natural logarithm of the peer CEOs-based target pay divided by firm's CEO pay level, both at year t-1. The implicit underlying assumption

is that compensation committees and board members try to correct the previous year distortions in their CEO pay.

The second benchmarking variable is proposed by Hypothesis 2. It is a contemporaneous measure - the current year logarithmic change in peer firms' pay. When determining CEO pay level, it is likely that boards and compensation consultants consider data on current pay trends at peer firms.

The third benchmarking variable relates to pay structure benchmarking. Our univariate tests in the previous section support the pay structure benchmarking idea (Hypothesis 3). Benchmarking of the pay structure necessarily affects the level of the pay components. For example, if pay component X is below peer group's median, its adjustment towards the median requires an increase in the pay level of X that is separate and supplementary to the other required adjustments of the pay level of X. The benchmarking variable representing pay structure gap is the difference between the median weight of pay component X in total compensation among the chosen peers and the corresponding weight at a sample firm.

Since, in essence, we have to integrate the benchmarking of the pay level with the benchmarking of the pay structure, the proposed model for each pay component is:

$$(5)\ \Delta Ln\big(\text{CEO compensation component X}_{i,t}\big) = \beta_0 +$$

$$\beta_1 Ln\big(\text{Relative compensation X}_{i,t-1}\big) + \beta_2 \Delta Ln\big(\text{Peer based target pay X}_{i,t}\big) +$$

$$\beta_3 \left[\left(\frac{\text{peer pay component X}}{\text{peer total compensation}}\right)_{i,t-1} - \left(\frac{\text{pay component X}}{\text{CEO total compensation}}\right)_{i,t-1}\right] + \beta_4 \Delta Ln\big(\text{Sales}_{i,t-1}\big) +$$

$$\beta_5 \Delta Ln\big(\text{Sales}_{i,t}\big) + \beta_6 \Delta\big(\text{Stock return}_{i,t}\big) + \beta_7 \Delta\big(\text{Stock return}_{i,t-1}\big) + \beta_8 \Delta\big(\text{ROA}_{i,t}\big) +$$

$$\beta_9 \Delta\big(\text{ROA}_{i,t-1}\big) + \beta_{10} \Delta Ln\big(\text{Risk}_{i,t-1}\big) + \beta_{11} \Delta Ln\big(\text{Risk}_{i,t}\big) + \beta_{12} \Delta\big(\text{MTB}_{i,t-1}\big) +$$

$\beta_{13}\Delta\left(MTB_{i,t}\right) + \beta_{14}\Delta\left(Leverage_{i,t-1}\right) + \beta_{15}\Delta\left(Leverage_{i,t}\right) +$

$\beta_{16}\left(IndustryDum_{i,t}\right) \times \left(YearDum_t\right) + \varepsilon_{i,t}$ ,

where i indexes firms, X indexes the compensation components, t indexes time, and all other explanatory variables are as previously defined (see also the Appendix).

Table 6 presents the results of fitting the integrated benchmarking model to the data. For brevity, only statistically significant coefficients at the 10% level or better are shown.

The estimated coefficients of Ln(relative compensation X) are positive and highly statistically significant for all pay components. The magnitude of the coefficients ranges from about 0.07 for salary to 0.33 for performance pay. The coefficient estimates indicate how CEO's pay is adjusted to her pay status relative to peer CEOs in the previous year. For example, a CEO with a performance pay that is 1% below (above) the target pay in year t-1 receives ceteris paribus a performance pay increase in year t that is 0.33% larger (smaller) than that of a CEO whose year t-1 performance pay equals the target performance pay. The adjustment magnitude of the various compensation components tends to be slightly lower than the adjustment coefficient of 0.31 estimated by Bizjak et al. (2011) for total pay using data for 2006. However, the clear conclusion is that pay components are benchmarked. The gap in CEO pay component X relative to peers triggers a significant revision (correction towards the peers) in the next year.

The coefficients on our second benchmarking variable, the contemporaneous change in target pay (based on the contemporaneous change in peers' pay), are positive and statistically significant at 1% level, the only exception being the coefficient in the salary regression that is significant at 10% level only. These findings support

Hypothesis 2. The estimated effect of a 1% increase in peers-based target pay varies from a low of 0.03% increase in salary to a high of 0.2% increase in equity pay.

The coefficients of our pay structure benchmarking variable, the distance from peer group median in the weight of pay component X in total compensation, are positive and significant at 1% level for salary, performance pay and equity pay. The corresponding coefficients in the non-equity performance pay and option awards regressions are significant at 5% level, whereas the coefficient in the stock awards regression is statistically insignificant. The difference in the significance level between equity pay and its elements (stock and option awards) may imply that boards adjust pay structure on the aggregate level of equity pay rather than examining each element separately.

The coefficient estimates of the weight difference range from a low of 0.027 for salary to a high of 0.33 for equity pay. This coefficient means, for example, that a CEO whose proportion of equity pay is 1% below (above) the peer group median receives ceteris paribus an increase in equity pay that is about 0.33% larger (smaller) than a CEO whose proportion of equity pay is similar to the peer group median. The coefficient on the distance from peer group median in the salary regression is the lowest across all pay components, implying an incremental increase (decrease) in salary pay of only 0.03% for a CEO whose proportion of salary in total pay is 1% below (above) the peer group median.

[Insert Table 6 about here]

The results in Table 6 support Hypothesis 3 and show that year by year changes in CEO pay component X are also affected by the wedge between the firm and its peer group in the weight of pay component X in total compensation. Table 6 also confirms

the effects of the relative pay status of the CEO in year t-1 and of the change in peer group compensation between year t-1 and t. Thus, in sum, it appears that CEO pay components are adjusted based on three benchmarking criteria: 1) the relative-to-the-peers size of the pay component in the previous year; 2) current year revisions of the pay component level at the peers, and 3) the previous year difference in pay component weight in total compensation from its peer group median weight.

It is also interesting to test whether the pay components are benchmarked differently. To test the difference across various pay components in the benchmarking variables' coefficients, we employ the seemingly unrelated regressions (SUR) methodology. There are two motivations for using the SUR framework: 1) to achieve more efficient estimation by combing information from different equations, and 2) to test restrictions that involve parameters from all equations. When examining different pay components, the residuals of these regressions are expected to be correlated because there are common unobserved factors that influence year by year changes in pay across all pay components.

The equation system we use comprises the three major pay components: salary, non-equity incentive and equity pay. For each of these components we use the model specified in equation (5) above. For example, for salary we use:

6) $\Delta\mathrm{Ln}\big(\mathrm{Salary}_{i,t}\big)$

$$= \beta_0 + \beta_1 \mathrm{Ln}\big(\mathrm{Relative\ salary}_{i,t-1}\big) + \beta_2 \Delta\mathrm{Ln}\big(\mathrm{Target\ salary}_{i,t}\big)$$

$$+ \beta_3 \left[ \left(\frac{\mathrm{peer's\ salary}}{\mathrm{peer\ total\ compensation}}\right)_{i,t-1} - \left(\frac{\mathrm{CEO's\ salary}}{\mathrm{CEO\ total\ compensation}}\right)_{i,t-1} \right]$$

$$+ \sum_{m=4}^{15} \beta_{mt} \mathrm{Controls}_{mt,i} + \sum_{m=4}^{15} \beta_{mt-1} \mathrm{Controls}_{mt-1,i}$$

$$+ \beta_{16}\big(\mathrm{IndustryDum}_{i,t}\big) \times \big(\mathrm{YearDum}_t\big) + \varepsilon_{i,t}$$

The null hypothesis is that the coefficients describing benchmarking are equal across the three pay components' regressions. The alternative hypotheses propose differences in the adjustment coefficients. For example, regarding $\beta_1$, it is interesting to examine two alternatives

H1a : $\beta_{1,Salary} \neq \beta_{1,non-equity\ performance\ pay} \neq \beta_{1,equity\ pay}$ , and

H1b : $\beta_{1,non-equity\ performance\ pay} \neq \beta_{1,equity\ pay}$

The results of the SUR estimation are presented in Panel A of Table 7. The coefficients of the SUR estimation are generally consistent with those reported in Table 6.

Panel B of Table 7 summarizes the results of F-tests examining cross-components (i.e., cross-equations) differences in the benchmarking coefficients. For all three benchmarking measures, there is a significant difference in the coefficients when salary, equity pay and non-equity performance pay are compared. This variation stems from the weaker benchmarking of CEO's salary.

A possible explanation for the milder adjustment of the salary component is that the salary compensation is subject to the one million dollar tax deductibility rule. Thus, firms that approach the one million dollars cap from below might find it more costly to adjust their CEO base salary at the same rate as other components of pay. Consequently, pay adjustment of salary would be milder.

To further explore the one-million dollar cap explanation, we generate a dummy variable that equals 1 when CEO's previous year base salary is below 900 thousand dollars, and zero otherwise. Presumably, CEOs with a salary below 900 thousand dollars are less restricted by the one-million salary cap regulation. This dummy variable is then interacted with the benchmarking measure, $\text{Ln}(\text{Relative salary}_{i,t-1})$. Adding this interaction term to the SUR system, we find that for CEOs who earn a salary below

900 thousand dollars, the adjustment coefficient is 0.086. This coefficient is statistically significantly higher than the over 900 thousand dollars respective coefficient of 0.072. Thus, the one-million dollars cap appears to mitigate salary adjustments.

However, the salary cap is a partial explanation only. The adjustment coefficient for the subsample of below 900 thousands salary is still markedly lower than the adjustment coefficient of 0.26 estimated for the two other pay components (equity pay and non-equity performance pay). The conclusion is that the one-million dollar cap cannot adequately explain the considerably lower magnitude of adjustment of the salary component documented in Panel B of Table 7. Perhaps the fact that salary is a "sure" cash pay component causes boards to adjust it more conservatively than the uncertain performance-related pay components.

The difference in adjustment coefficients between equity pay and non-equity performance pay are statistically insignificant. Nevertheless, note in Panel B of Table 7 that the coefficient on the weight difference of pay component X from peer group's median is equal to 0.41 for equity pay and 0.21 for non-equity performance pay. This might indicate some differences between equity and non-equity performance pay in the response to deviations from the desired mix of compensation.

[Insert Table 7 about here]

In sum, only the salary component of pay appears to be benchmarked differently. We do not find a significant variation in the magnitude of the adjustments to peer effects between equity pay and non-equity performance pay.

Overall, the results in this section suggest that the practice of compensation benchmarking significantly affects year by year changes in CEO pay. These findings are consistent with hypotheses 1 through 3, and widely extend previous evidence on

benchmarking. The results also document that boards adjust CEO pay only partially, which suggests that boards use benchmarking cautiously.

**5.3. Discussion: Are pay components benchmarked differently than total pay?**

This study analyses each pay component separately. A critical basic question is: Is it necessary? Given previous studies' evidence that total compensation is benchmarked, it is quite expected that each component of pay is benchmarked as well.

We can test directly the proposition that pay components are benchmarked differently than total compensation by fitting the following model:

$$7)\ \Delta Ln\big(Pay\ component\ X_{i,t}\big)$$

$$= \beta_0 + \beta_{1T} Ln\big(Relative\ total\ pay_{i,t-1}\big) + \beta_{2T} \Delta Ln\big(Target\ total\ pay_{i,t}\big)$$

$$+ \beta_1 Ln\big(Relative\ pay\ component\ X_{i,t-1}\big) + \beta_2 \Delta Ln\big(Target\ pay\ component\ X_{i,t}\big)$$

$$+ \sum_{m=3}^{14} \beta_{mt} Controls_{mt,i} + \sum_{m=3}^{14} \beta_{mt-1} Controls_{mt-1,i}$$

$$+ \beta_{15}\big(IndustryDum_{i,t}\big) \times \big(YearDum_t\big) + \varepsilon_{i,t}$$

Equation (7) allows both total pay and individual component benchmarking. (For example, it uses both previous-year relative total pay and previous-year relative pay component as explanatory variables.) Under the conservative Null hypothesis (benchmarking of all pay components is identical to that of total pay), the coefficients $\beta_1$ and $\beta_2$ in equation (7) should equal 0 for all pay components. This is because according to the Null there is only one set of benchmarking criteria – those based on total pay, i.e., the other set of benchmarking criteria is redundant.

Further, in practice, to avoid distortions due to the multicollinearity, we regress relative pay component X on relative total pay, and use the residual of this regression instead of relative pay component X in the regression of equation (7). (The same is done

with respect to target pay component X.) This pre-test orthogonalization process makes rejections of the Null even more difficult.

Table 8 presents the results of fitting equation (7) to the three key pay components data using the SUR (Seemingly Unrelated Regressions) methodology. On the left side of the table we report results of regressions with only total pay benchmarking variables, while on the right side we report results of regressions with both total pay and individual pay component benchmarking variables. In Table 8, the coefficients of all pay component benchmarking variables (that are residuals from regressing the component benchmarking criterion on the respective total pay benchmarking criterion) are positive and statistically significant at the 5% level at least. Furthermore, the system weighted $R^2$ of the formulation that includes pay component benchmarking (0.30) is remarkably higher than the system weighted $R^2$ of the formulation with only total pay benchmarking (0.23). It appears that total pay benchmarking cannot fully explain the revision in pay component X. Considerations specific to benchmarking pay component X also impact (and perhaps are the main factor in) the decision on how to revise this year level of pay component X.

[Insert Table 8 about here]

More formally, the Null hypothesis proposes that in our system of three pay components regressions:

$\beta_{1,Salary} = \beta_{1,non-equity\ performance\ pay} = \beta_{1,equity\ pay} = 0$, and

$\beta_{2,Salary} = \beta_{2,non-equity\ performance\ pay} = \beta_{2,equity\ pay} = 0$.

These implications of the Null are tested and rejected by the data at the 1% level. Clearly, benchmarking of a pay component are affected not only by the benchmarking of total pay. It appears that each pay component also receives special attention, i.e.,

benchmarking of its own. Besides comparing CEO's total pay to that of peers, boards also compare CEO's pay component X to that of peers. This result is not surprising. For if boards also benchmark the composition of CEO pay (pay mix), as we propose in this study, pay adjustments cannot rely only on total pay relative to peers; they must also depend on the level of CEO's pay component X relative to its counterpart at peer firms. In some sense the tests in this section supplement our main tests and reinforce our conclusion that separate benchmarking attention is devoted to key pay components.

## 5.4. Some robustness tests

We conduct several tests for our reported results, trying to remove noise and assist inference. First, we exclude the 589 firm-year observations that had a non-median target for pay components. Re-estimating equation (4) in a subsample that does not include firms that report targets other than the median, yields almost identical coefficients. Our conclusions remain intact.

A second concern is that firms that do not use all available pay components to compensate their CEOs introduce noise into the picture. In order to address this concern, we repeat the analysis confining the sample to observations where all pay components are non-zero. In general, stronger adjustments to the target (larger coefficients) are found for all our benchmarking variables. Interestingly, the SUR estimation in this subsample identifies a significant difference at the 10% level between equity and non-equity pay response to a gap in the weight of the pay component in total compensation (from the median weight of that component in the peer group). This result might indicate that equity pay responds more vigorously than non-equity performance pay to a "distortions" in its weight in total compensation.

Other robustness tests are meant to check various technical aspects. For example, we rerun the analysis using firm fixed effects (instead of industry-year fixed effects) to control for individual firms' pay patterns. When firm fixed effects are employed, the adjusted $R^2$s of regressions of equation (5) drop from an average of 23% to 21%. The coefficients of Ln(relative compensation X) and of the distance in the proportion of pay component X from peer group's median, remain almost the same, while the coefficients of the current year logarithmic change in peer firms' pay component X increase significantly. In sum, the firm fixed effects regressions continue to support all our findings and conclusions.

We also replicate the main tests using two-digit SIC codes instead of the Fama and French (1997) 49 industry classification. The results are similar. Last, we re-estimate all specification with winsorized control variables (sales, lagged sales, stock return, lagged stock return, ROA, lagged ROA, standard deviation, lagged standard deviation, market-to-book, lagged market-to-book, leverage and lagged leverage) at a 2.5% and 97.5%. The results are similar, and all conclusions remain intact.

## 6. Summary

Compensation benchmarking is an important and prevalent tool in setting CEOs' pay. This study aspires to examine and describe in greater detail the benchmarking practices of CEO's pay components, based on a relatively large sample of compensation data for S&P 1500 firms (and their peers) in 2007-2013.

We contribute several important new observations. First, we show that the benchmarking of pay components is different than that of total pay. This is because benchmarking is used also with respect to the structure of CEO pay (i.e., the mix of pay components). Individual firm's pay structure is strongly adjusted towards that of its

peer group. One possible reason for it may be board's recognition that each pay component has its own motivational role, hence it is essential to maintain a proper balance between all pay components.

Second, we show that the adjustment of salary to that of selected peers is significantly milder than the adjustment of non-equity performance pay and equity pay. This difference illustrates that pay components are not benchmarked identically. It appears that each pay component is considered and benchmarked individually. Last, we also introduce an elaborated model of CEO pay that incorporates both contemporaneous and lagged values of commonly used economic determinates of CEO pay.

## Appendix: Variables' Description

| Variable | Description |
|---|---|
| **I. Benchmarking related variables:** | |
| Change in Ln(target pay) | A contemporaneous benchmarking measure defined as the logarithmic change in peer firms' target pay from year t-1. This measure is computed for each component of CEO pay. |
| Distance in the proportion of pay measure X from peer group median | The difference between the median weight of pay component X in peer firms' total compensation and the corresponding weight at a disclosing firm, both at year t-1. |
| Ln(relative compensation) | A benchmark measure defined as the natural logarithm of the peer group target pay divided by firm's CEO pay level, both at year t-1. This measure is computed for each component of CEO pay. |
| **II. Compensation related variables:** | |
| All other compensation | Execucomp data item OTHCOMP; ECA variable name OtherAnnualCompensation and; Morningstar dataID 601127, AllOtherCompensation. |
| Bonus | Execucomp data item BONUS; ECA variable name AnnualBonus and; Morningstar dataID 60119, Bonus. |
| Equity pay | The sum of option awards and stock awards. |
| Non-equity incentive plan compensation | Execucomp data item NONEQ_INCENT; ECA variable name NonEquityIncentivePayout and; Morningstar dataID 601125, NonEquityIncentiveAward. |
| Non-equity performance pay | The sum of bonus and non-equity incentive plan compensation. |
| Option awards | Execucomp data item OPTION_AWARDS; ECA variable name OptionAwards and; Morningstar dataID 601124, OptionAward. |
| Other pay | The sum of change in pension value and non-qualified deferred compensation earnings and all other compensation. |
| Performance pay | The sum of bonus, option awards, stock awards and non-equity incentive plan compensation. |

| | |
|---|---|
| Salary | Execucomp data item SALARY; ECA variable name DisclosedSalary and; Morningstar dataID 60118, Salary. |
| Stock awards | Execucomp data item STOCK_AWARDS; ECA variable name StockAwards and; Morningstar dataID 601121, RestrictedStockAward. |
| Total compensation | Total compensation is the sum of salary, bonus, option awards, stock awards, non- equity incentive plan compensation, change in pension value and non-qualified deferred compensation earnings and all other compensation. Salary, bonus, option awards, stock awards, non-equity incentive plan compensation, change in pension value and non-qualified deferred compensation earnings and all other compensation. These compensation components disclosed in the summary compensation table of each public firm since December 2006. Execucomp data item TOTAL_SEC; ECA variable name DisclosedTotalCompensation and; Morningstar dataID 60128, TotalCompensation. |

**III. Control Variables**

| | |
|---|---|
| CEO age | The age of the CEO in years. |
| CEO Duality | A dummy variable equal to 1 when the CEO is also the Chairman of the board (and 0 otherwise) |
| Leverage | Total liabilities (Compustat data item LT) divided by the sum of total liabilities and the market value of equity (Compustat data items LT+CSHO*PRCC_F) at year t end. |
| Ln(Sales) | The natural logarithm of firm's sales revenue in millions of Dollars in year t (Compustat data item SALE). |
| Ln(monthly return standard deviation) | The natural logarithm of the standard deviation of the monthly stock returns in the thirty-six months preceding the end of the current fiscal year. |
| market-to-book value | The ratio of market value of equity to the book value of equity at year t's end (Compustat data items [CSHO*PRCC_F+TL+PSTKL-TXDITC]/AT). |
| ROA | Return on assets calculated as the ratio of income before extraordinary items (Compustat data item IB) to total assets (Compustat data item AT) in year t. |
| Stock return | The stock returns including dividends (Compustat data item RET) for the current fiscal year (year t). |

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**Table 1: Exclusion report.**

We start with all CEOs of S&P 1500 firms in 2007-2013.

| Exclusion criteria | Number of firm-year observations |
|---|---|
| Initial sample | 10,481 |
| missing compensation data | 93 |
| zero values for total compensation | 35 |
| CEOs are in their first or last year of service | 2,000 |
| no available data on compensation peers | 1,830 |
| peer group comprises only 1-2 firms | 33 |
| missing compensation data for 50% or more of the disclosed peers | 396 |
| Co-CEOs | 34 |
| firms in the financial services industry | 1,168 |
| Final sample | 4,892 |

**Table 2: Descriptive statistics of CEO's pay and its components.**

The sample comprises CEOs of S&P 1500 firms in 2007-2013. Panel A reports descriptive statistics for CEO actual and target pay levels. CEO's target pay is based on peer compensation data in the previous year. All compensation figures are in thousands of dollars. Panel B reports descriptive statistics for actual and target pay changes from year t-1 to year t. Panel C reports descriptive statistics for the weight of various compensation components in total compensation at the disclosing firms, as well as the respective weights based on peer compensation data in the previous year. Target percentile is set to the median, unless the firm explicitly reports another target. All compensation figures are winsorized at the 2.5th and 97.5th percentiles. Definition of and details on all variables are provided in the Appendix.

Panel A: Annual pay levels of CEOs (in thousands of dollars)

| | Mean | Std. dev. | Median | N | Mean | Std. dev. | Median | N |
|---|---|---|---|---|---|---|---|---|
| | Pay level among disclosing firms | | | | Target pay based on peers' compensation | | | |
| Total compensation | 6,964 | 5,654 | 5,260 | 4,869 | 6,853 | 4,479 | 5,617 | 4,892 |
| Salary | 884 | 320 | 850 | 4,892 | 875 | 257 | 863 | 4,892 |
| Bonus | 110 | 367 | 0 | 4,892 | 27 | 160 | 0 | 4,892 |
| Option awards | 1,258 | 1,663 | 653 | 4,891 | 1,160 | 1,159 | 834 | 4,892 |
| Stock awards | 2,343 | 2,528 | 1,500 | 4,887 | 1,935 | 1,680 | 1,474 | 4,892 |
| Non-equity incentive plan compensation | 1,296 | 1,420 | 881 | 4,891 | 1,128 | 871 | 941 | 4,892 |
| Change in pension value and nonqualified deferred compensation earnings | 524 | 1,060 | 0 | 4,876 | 365 | 698 | 0 | 4,892 |
| All other compensation | 184 | 275 | 79 | 4,891 | 140 | 136 | 103 | 4,892 |
| Aggregate pay components | | | | | | | | |
| Performance pay | 5,232 | 4,568 | 3,869 | 4,886 | 5,075 | 3,522 | 4,129 | 4,892 |
| Equity pay | 3,692 | 3,435 | 2,651 | 4,887 | 3,505 | 2,581 | 2,845 | 4,892 |
| Non-equity performance pay | 1,436 | 1,490 | 984 | 4,891 | 1,345 | 999 | 1,100 | 4,892 |
| Other pay | 752 | 1,256 | 187 | 4,875 | 602 | 819 | 246 | 4,892 |

**Table 2- Continued**

Panel B: Annual changes in CEO pay

| | Mean | Std. dev. | Median | N | Mean | Std. dev. | Median | N |
|---|---|---|---|---|---|---|---|---|
| | Pay changes at disclosing firms | | | | Target pay changes based on peers' pay | | | |
| Change in Ln (total compensation ) | 0.085 | 0.44 | 0.071 | 4,859 | 0.058 | 0.24 | 0.054 | 4,813 |
| Change in Ln (salary) | 0.042 | 0.057 | 0.030 | 4,866 | 0.042 | 0.063 | 0.038 | 4,813 |
| Change in Ln (performance pay) | 0.11 | 0.57 | 0.077 | 4,769 | 0.078 | 0.31 | 0.066 | 4,813 |
| Change in Ln (equity pay) | 0.096 | 0.52 | 0.071 | 4,333 | 0.12 | 0.53 | 0.082 | 4,747 |
| Change in Ln (non-equity performance pay) | 0.037 | 0.63 | 0.038 | 4,100 | 0.027 | 0.58 | 0.018 | 4,732 |
| Change in Ln (other pay) | 0.019 | 0.83 | 0.038 | 4,697 | -0.039 | 0.57 | 0.019 | 4,813 |

**Table 2-** *Continued*

Panel C: CEO compensation structure

| | Mean | Std. dev. | Median | N | Mean | Std. dev. | Median | N |
|---|---|---|---|---|---|---|---|---|
| | Compensation structure at disclosing firms | | | | Compensation structure at chosen peers | | | |
| Salary/Total compensation | 0.19 | 0.13 | 0.16 | 4,869 | 0.17 | 0.076 | 0.15 | 4,892 |
| Bonus/Total compensation | 0.020 | 0.066 | 0 | 4,869 | 0.0036 | 0.022 | 0 | 4,892 |
| Option awards/Total compensation | 0.17 | 0.18 | 0.15 | 4,869 | 0.15 | 0.11 | 0.16 | 4,892 |
| Stock awards/Total compensation | 0.31 | 0.22 | 0.31 | 4,869 | 0.26 | 0.13 | 0.27 | 4,892 |
| Non-equity incentive plan compensation/Total compensation | 0.19 | 0.15 | 0.18 | 4,869 | 0.16 | 0.071 | 0.17 | 4,892 |
| | | | | | | | | |
| Aggregate pay components | | | | | | | | |
| Performance pay/Total compensation | 0.71 | 0.17 | 0.75 | 4,869 | 0.73 | 0.094 | 0.75 | 4,892 |
| Equity pay/Total compensation | 0.49 | 0.21 | 0.52 | 4,869 | 0.49 | 0.13 | 0.51 | 4,892 |
| Non-equity performance pay/Total compensation | 0.21 | 0.14 | 0.19 | 4,869 | 0.20 | 0.070 | 0.20 | 4,892 |
| | | | | | | | | |
| Other pay/Total compensation | 0.092 | 0.12 | 0.037 | 4,869 | 0.072 | 0.069 | 0.047 | 4,892 |

**Table 3: Descriptive statistics of potential determinants of CEO pay and its components.**

The sample comprises CEOs of S&P 1500 firms in 2007-2013. Stock return is the stock returns including dividends (Compustat data item RET) for the current fiscal year (year t); ROA is the return on assets calculated as the ratio of income before extraordinary items (Compustat data item IB) to total assets (Compustat data item AT) in year t; Sales is the firm's sales revenue in millions of Dollars in year t (Compustat data item SALE); Monthly return standard deviation is the standard deviation of the monthly stock returns in the thirty-six months preceding the end of the current fiscal year; Market-to-book value is the ratio of market value of equity to the book value of equity at end of year t (Compustat data items [CSHO*PRCC_F+TL+PSTKL-TXDITC]/AT); Leverage is total liabilities (Compustat data item LT) divided by the sum of total liabilities and the market value of equity (Compustat data items LT+CSHO*PRCC_F) at the end of year t; CEO age is the age of the CEO in years; and CEO duality is a dummy variable equal to 1 when the CEO is also the Chairman of the board (and 0 otherwise).

|  | Mean | Std. dev. | Median | N |
|---|---|---|---|---|
| Stock return | 0.15 | 0.44 | 0.12 | 4,881 |
| ROA | 0.052 | 0.092 | 0.054 | 4,883 |
| Sales (in millions of dollars) | 8,510 | 25,489 | 2,242 | 4,883 |
| Monthly return standard deviation | 0.11 | 0.049 | 0.10 | 4,813 |
| Market-to-book value | 1.80 | 1.07 | 1.48 | 4,516 |
| Leverage | 0.36 | 0.20 | 0.33 | 4,873 |
| CEO age | 56 | 7 | 56 | 4,883 |
| CEO duality | 0.16 | 0.36 | 0 | 4,892 |

**Table 4: An elaborated model of the level of CEO compensation.**

The table reports regression estimates of equation (2). The sample comprises CEOs of S&P 1500 firms in 2007-2013. The dependent variables are the natural logarithm of CEO total compensation, salary, performance pay, non-equity performance pay, equity pay, stock awards and option awards, all in year t. Definition of and details on all variables are provided in the Appendix. Year × Industry FE are dummy variables for each unique combination of industry and year based on Fama and French (1997) 49 industry classification. To overcome multicollinearity between the contemporaneous and lagged variables, we first regress the contemporaneous (year t) level of each of the economic determinant on its lagged (year t-1) value. Then, we use the residuals of these preliminary regressions as explanatory variables here. Standard errors, reported in parentheses, are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

| | Ln(CEO compensation component) | | | | | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | Total compensation | Salary | Performance pay | Non-equity performance pay | Equity pay | Stock awards | Option awards |
| Intercept | 4.79*** | 5.15*** | 4.47*** | 3.025*** | 4.27*** | 4.33*** | 3.56*** |
| | (0.25) | (0.099) | (0.29) | (0.28) | (0.35) | (0.32) | (0.42) |
| Lagged Ln(sales) | 0.39*** | 0.17*** | 0.44*** | 0.36*** | 0.49*** | 0.43*** | 0.46*** |
| | (0.017) | (0.0079) | (0.022) | (0.023) | (0.018) | (0.021) | (0.021) |
| Ln(sales) | 0.39*** | 0.055** | 0.60*** | 0.58*** | 0.45*** | 0.42*** | 0.30*** |
| | (0.063) | (0.026) | (0.084) | (0.10) | (0.08) | (0.091) | (0.098) |
| Stock return | 0.20*** | -0.0065 | 0.27*** | 0.42*** | 0.17*** | 0.15** | 0.16*** |
| | (0.037) | (0.016) | (0.050) | (0.056) | (0.051) | (0.071) | (0.059) |
| One-year lagged stock return | 0.13*** | 0.0068 | 0.19*** | 0.18*** | 0.074** | 0.097** | 0.074* |
| | (0.025) | (0.01) | (0.033) | (0.037) | (0.033) | (0.038) | (0.038) |

**Table 4-** *Continued*

| | Ln(CEO compensation component) | | | | | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | Total compensation | Salary | Performance pay | Non-equity performance pay | Equity pay | Stock awards | Option awards |
| ROA | -0.12 | 0.12* | -0.11 | 1.25*** | -0.56*** | -0.28 | -0.78*** |
| | (0.13) | (0.062) | (0.19) | (0.29) | (0.20) | (0.25) | (0.22) |
| One-year lagged ROA | -0.25* | -0.13** | -0.29*** | -0.23 | -0.43** | -0.27 | -0.61*** |
| | (0.14) | (0.059) | (0.22) | (0.26) | (0.19) | (0.21) | (0.21) |
| Lagged Ln(monthly return standard deviation) | -0.14*** | -0.017 | -0.14** | -0.094 | -0.089 | -0.13* | 0.08 |
| | (0.047) | (0.021) | (0.061) | (0.071) | (0.061) | (0.075) | (0.072) |
| Ln(monthly return standard deviation) | -0.23*** | -0.0081 | -0.31*** | -0.25** | -0.26*** | -0.25** | -0.11 |
| | (0.065) | (0.026) | (0.087) | (0.099) | (0.083) | (0.11) | (0.11) |
| Lagged market-to-book value | 0.046** | -0.017 | 0.043 | -0.00027 | 0.12*** | 0.057* | 0.20*** |
| | (0.021) | (0.010) | (0.029) | (0.026) | (0.024) | (0.031) | (0.03) |
| Market-to-book value | 0.031 | 0.014 | 0.028 | 0.04 | -0.00039 | -0.0075 | 0.018 |
| | (0.029) | (0.012) | (0.038) | (0.033) | (0.036) | (0.052) | (0.042) |
| Lagged leverage | -0.043 | 0.046 | -0.14 | 0.15 | -0.42** | -0.31 | -0.61*** |
| | (0.12) | (0.060) | (0.16) | (0.18) | (0.17) | (0.19) | (0.2) |
| Leverage | 0.28* | 0.098* | 0.29 | 0.042 | 0.47** | 0.56** | 0.049 |
| | (0.16) | (0.059) | (0.21) | (0.26) | (0.21) | (0.28) | (0.26) |

**Table 4-** *Continued*

| | Ln(CEO compensation component) | | | | | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | Total compensation | Salary | Performance pay | Non-equity performance pay | Equity pay | Stock awards | Option awards |
| CEO Age | 0.0035 | 0.0050*** | -0.0027 | 0.012*** | -0.0055 | -0.0042 | -0.0038 |
| | (0.0024) | (0.0013) | (0.003) | (0.0034) | (0.0034) | (0.0039) | (0.0041) |
| CEO Duality | 0.18*** | 0.099*** | 0.15*** | 0.22*** | 0.11* | 0.11 | 0.14** |
| | (0.044) | (0.019) | (0.058) | (0.063) | (0.061) | (0.072) | (0.068) |
| Year × Industry FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,192 | 4,212 | 4,206 | 3,786 | 3,976 | 3,581 | 2,660 |
| Adjusted $R^2$ | 0.57 | 0.62 | 0.48 | 0.42 | 0.49 | 0.39 | 0.45 |

**Table 5: Preliminary evidence on benchmarking in CEO compensation and its components.**

The sample comprises CEOs of S&P 1500 firms in 2007-2013. Panel A compares changes to CEO pay from year t-1 to year t based on CEO's pay status relative to peers in the previous year. The table shows the mean and the median logarithmic changes in pay for CEOs who are paid above the peer group target and for CEOs who are paid below the peer group target in the prior year. The analysis examines eight forms of CEO pay as follows: total compensation, salary, performance pay, non-equity performance pay, equity pay, stock awards, option awards and other pay. The Wilcoxon signed rank-sum test and t-test are used to assess statistical significance for differences in median and mean, respectively, between the above and below the target groups. Panel B focuses on the changes in the weight of various pay components in total compensation from year t-1 to year t. It compares two subsamples: 1) CEOs whose pay components weight in total compensation was above the peer group median in the previous year; and 2) CEOs whose pay component weight in total compensation was below the peer group median in the previous year. A $t$-test is used to assess the statistical significance of weight changes between the above and below target groups. Panel C presents the results of a regression that examines the benchmarking in the structure of CEO pay. The dependent variable is the change in the proportion of the pay component from year t-1 to year t. Year × Industry FE are dummy variables for each unique combination of industry and year, where industry is based on Fama and French (1997) 49 industry classification. Standard errors, reported in parentheses, are clustered at the firm level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. Definition of and details on all variables are provided in the Appendix.

*(Continued)*

**Table 5- *Continued***

Panel A: Mean and median changes in Ln(pay) for CEOs above and below the target pay (increase space between items)

| Pay component | Group | Number of observations | Mean change in pay | Median change in pay | *p*-values of the difference (one sided test) | |
|---|---|---|---|---|---|---|
| | | | | | *t*-test | Wilcoxon test |
| Total compensation | Above target | 1,853 | -0.087 | -0.027 | <.0001 | <.0001 |
| | Below target | 3,006 | 0.19 | 0.14 | | |
| Salary | Above target | 2,012 | 0.025 | 0.020 | <.0001 | <.0001 |
| | Below target | 2,854 | 0.053 | 0.039 | | |
| Performance Pay | Above target | 1,909 | -0.11 | -0.027 | <.0001 | <.0001 |
| | Below target | 2,860 | 0.25 | 0.18 | | |
| Non-equity performance pay | Above target | 2,077 | -0.12 | -0.041 | <.0001 | <.0001 |
| | Below target | 2,023 | 0.19 | 0.15 | | |
| Equity pay | Above target | 1,934 | -0.090 | -0.0040 | <.0001 | <.0001 |
| | Below target | 2,399 | 0.25 | 0.17 | | |
| Stock awards | Above target | 2,023 | -0.030 | 0.026 | <.0001 | <.0001 |
| | Below target | 1,659 | 0.32 | 0.19 | | |
| Option awards | Above target | 1,891 | -0.064 | -0.000020 | <.0001 | <.0001 |
| | Below target | 899 | 0.19 | 0.11 | | |
| Other pay | Above target | 2,060 | -0.16 | -0.0039 | <.0001 | <.0001 |
| | Below target | 2,637 | 0.16 | 0.067 | | |

**Table 5-** *Continued*

Panel B: Preliminary evidence on benchmarking of the structure of CEO pay (increase space between items)

| Pay component | Group | Number of observations | Mean weight of pay component in total compensation in year t-1 | Mean change in the weight of the pay component | *p*-value of the change (based on a one-sided *t*-test) |
|---|---|---|---|---|---|
| Salary | Above median | 2,798 | 0.26 | -0.037 | <.0001 |
| | Below median | 2,061 | 0.13 | 0.025 | |
| Performance pay | Above median | 2,409 | 0.80 | -0.036 | <.0001 |
| | Below median | 2,450 | 0.59 | 0.063 | |
| Non-equity performance pay | Above median | 2,555 | 0.32 | -0.073 | <.0001 |
| | Below median | 2,304 | 0.12 | 0.051 | |
| Equity pay | Above median | 2,357 | 0.62 | -0.053 | <.0001 |
| | Below median | 2,502 | 0.32 | 0.10 | |
| Stock awards | Above median | 2,403 | 0.44 | -0.031 | <.0001 |
| | Below median | 2,456 | 0.13 | 0.094 | |
| Option awards | Above median | 2,269 | 0.33 | -0.059 | <.0001 |
| | Below median | 2,590 | 0.050 | 0.042 | |
| Other pay | Above median | 2,322 | 0.16 | -0.022 | <.0001 |
| | Below median | 2,537 | 0.033 | 0.014 | |

**Table 5-** *Continued*

Panel C: Regression tests of benchmarking in the structure of CEO pay

| | Change in the weight of pay component X in total compensation | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Salary | Performance pay | Non-equity performance pay | Equity pay | Stock awards | Option awards |
|---|---|---|---|---|---|---|
| Distance from peer group's median weight | 0.50*** | 0.49*** | 0.54*** | 0.5*** | 0.34*** | 0.34*** |
| | (0.027) | (0.020) | (0.02) | (0.02) | (0.015) | (0.016) |
| Year × Industry FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,859 | 4,859 | 4,859 | 4,859 | 4,859 | 4,859 |
| Adjusted $R^2$ | 0.32 | 0.32 | 0.34 | 0.31 | 0.18 | 0.22 |

**Table 6: The effect of benchmarking on the yearly revision in CEO pay components.**

The table presents the results of fitting equation (5). The sample comprises CEOs of S&P 1500 firms in 2007-2013. Definition of and details on all variables are provided in the Appendix. Year × Industry FE are dummy variables for each unique combination of industry and year, using Fama and French (1997) 49 industry classification. Note that for each pay component, we fit an individual parsimonious model that is restricted to include only explanatory variables that are significant at 1% level at least in our basic pay components regressions (see Table 4). Further, statistically insignificant coefficients are omitted from the table. Standard errors, reported in parentheses, are clustered at the firm level. \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively.

| | Change in Ln (CEO compensation component X) | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Salary | Performance pay | Non-equity performance pay | Equity pay | Stock awards | Option awards |
| Intercept | 0.049 | -0.046 | 0.19 | -0.22 | -0.10 | 0.048*** |
| | (0.033) | (0.19) | (0.32) | (0.27) | (0.22) | (0.014) |
| Ln(relative compensation of X) | 0.069*** | 0.33*** | 0.24*** | 0.26*** | 0.26*** | 0.18*** |
| | (0.0071) | (0.022) | (0.025) | (0.022) | (0.022) | (0.021) |
| Change in Ln(peer-based target pay of X) | 0.026* | 0.19*** | 0.18*** | 0.20*** | 0.16*** | 0.15*** |
| | (0.015) | (0.033) | (0.033) | (0.025) | (0.023) | (0.022) |
| Distance in the proportion of pay component X from peer group median | 0.027*** | 0.23*** | 0.18** | 0.33*** | 0.10 | 0.21** |
| | (0.0076) | (0.073) | (0.091) | (0.072) | (0.08) | (0.099) |

**Table 6-** *Continued*

| | Change in Ln (CEO compensation component X) | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Salary | Performance pay | Non-equity performance pay | Equity pay | Stock awards | Option awards |
| Change in lagged Ln(sales) | 0.038*** | | -0.27*** | | | 0.22*** |
| | (0.0058) | | (0.078) | | | (0.078) |
| Change in Ln(sales) | | 0.44*** | 0.53*** | 0.32*** | 0.3*** | 0.25*** |
| | | (0.065) | (0.099) | (0.065) | (0.075) | (0.078) |
| Change in stock return | | 0.1*** | 0.23*** | | | 0.07** |
| | | (0.021) | (0.031) | | | (0.028) |
| Change in one-year lagged stock return | | 0.08** | 0.085** | | | |
| | | (0.031) | (0.04) | | | |
| Change in ROA | | | 0.91*** | | | |
| | | | (0.24) | | | |
| Change in lagged ROA | | | | | | |
| Change in lagged Ln(monthly return standard deviation) | | | | | | |
| Change in Ln(monthly return standard deviation) | | -0.19*** | | -0.19*** | | |
| | | (0.049) | | (0.060) | | |

**Table 6-** *Continued*

| | Change in Ln (CEO compensation component X) | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Salary | Performance pay | Non-equity performance pay | Equity pay | Stock awards | Option awards |
| Change in lagged market-to-book value | | | | 0.08*** | | 0.062*** |
| | | | | (0.017) | | (0.022) |
| Change in market-to-book value | | | | | | |
| Change in lagged leverage | | | | | | -0.802*** |
| | | | | | | (0.21) |
| Change in leverage | | | | | | |
| Year × Industry FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,749 | 4,454 | 3,923 | 3,715 | 3,443 | 2,010 |
| Adjusted $R^2$ | 0.18 | 0.30 | 0.29 | 0.25 | 0.21 | 0.16 |

**Table 7: Variation in benchmarking across the three central pay components.**

Panel A presents the results of fitting equation (5) on a system of 3 key pay components (salary, non-equity performance pay and equity pay) using seemingly unrelated regressions. Panel B reports F-tests of the differences in benchmarking coefficients across our three pay components. The sample comprises CEOs of S&P 1500 firms in 2007-2013. Definition of and details on all variables are provided in the Appendix. Year × Industry FE are dummy variables for each unique combination of industry and year based on Fama and French (1997) 49 industry classification. Note that for each pay component, we employ an individual parsimonious model that is restricted to include only explanatory variables that are significant at 1% level at least in our basic pay components regressions (see Table 4). Further, statistically insignificant coefficients are omitted from the table. Standard errors are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A

Results from fitting equation (5) using seemingly unrelated regressions.

| | Change in Ln (CEO compensation component X) | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| | Salary | Non-equity performance pay | Equity pay |
| Intercept | 0.054*** | 0.029 | 0.099*** |
| | (0.0032) | (0.034) | (0.030) |
| Ln(relative compensation of X) | 0.09*** | 0.26*** | 0.26*** |
| | (0.0047) | (0.017) | (0.016) |
| Change in Ln(peer-based target pay of X) | 0.042** | 0.19*** | 0.21*** |
| | (0.017) | (0.022) | (0.024) |
| Distance from peer group's median weight | 0.022* | 0.23** | 0.40*** |
| | (0.012) | (0.11) | (0.073) |
| Other explanatory variables as in Table 6 | Yes | Yes | Yes |
| Year × Industry FE | Yes | Yes | Yes |
| Observations | 3,150 | 3,150 | 3,150 |
| System Weighted $R^2$ | | 0.31 | |

**Table 7-** *Continued*

Panel B
Examining differences in benchmarking across pay components.

| H0: The coefficients of Ln (relative compensation of X) are equal in the equations of | *F*- statistic | *p*-value |
|---|---|---|
| Salary, non-equity performance pay and equity pay | 91.77 | 0.0001 |
| Non-equity performance pay and equity pay | 0.03 | 0.87 |

| H0: The coefficients of Change in Ln (peer-based target pay of X) are equal in the equations of | *F*- statistic | *p*-value |
|---|---|---|
| Salary, non-equity performance pay and equity pay | 23.72 | 0.0001 |
| Non-equity performance pay and equity pay | 0.32 | 0.57 |

| H0: The coefficients of Distance in the proportion of pay measure X from peer group median are equal in the equations of | *F*- statistic | *p*-value |
|---|---|---|
| Salary, non-equity performance pay and equity pay | 14.89 | 0.0001 |
| Non-equity performance pay and equity pay | 1.63 | 0.2 |

**Table 8: Tests of the difference in benchmarking between total compensation and pay components.**

The table presents the results of fitting equation (7) to a system of three key pay components (salary, non-equity performance pay and equity pay) using seemingly unrelated regressions. The sample comprises CEOs of S&P 1500 firms in 2007-2013. Definition of and details on all variables are provided in the Appendix. Year × Industry FE are dummy variables for each unique combination of industry and year based on Fama and French (1997) 49 industry classification. Note that for each pay component, we employ an individual parsimonious model that is restricted to include only explanatory variables that are significant at 1% level at least in our basic pay components regressions (see Table 4). To overcome multicollinearity between the benchmarking variables of total compensation and the benchmarking variables of pay component X, we first regress each benchmarking variable of pay component X on its corresponding benchmarking variable of total compensation. Then, we use the residuals of these regressions instead of the pay components in the regressions documented in this table. Standard errors are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

| | Change in Ln (CEO compensation) | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Salary | Non-equity performance pay | Equity pay | Salary | Non-equity performance pay | Equity pay |
| Intercept | 0.053*** | 0.060* | 0.09*** | 0.056*** | 0.019 | 0.091*** |
| | (0.0032) | (0.036) | (0.03) | (0.0032) | (0.034) | (0.03) |
| Ln(relative total compensation) | 0.017*** | 0.21*** | 0.38*** | 0.013*** | 0.18*** | 0.40*** |
| | (0.0021) | (0.023) | (0.019) | (0.0020) | (0.022) | (0.018) |
| Change in Ln(target of total pay) | 0.019*** | 0.098* | 0.23*** | 0.0099** | 0.035 | 0.24*** |
| | (0.0049) | (0.055) | (0.045) | -0.0049 | (0.053) | (0.045) |
| Ln(relative compensation of X) | | | | 0.092*** | 0.31*** | 0.31*** |
| | | | | (0.0053) | (0.015) | (0.019) |
| Change in Ln(peer-based target pay of X) | | | | 0.038** | 0.21*** | 0.22*** |
| | | | | (0.017) | (0.023) | (0.03) |
| Other explanatory variables as in Table 6 | Yes | Yes | Yes | Yes | Yes | Yes |
| Year × Industry FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,197 | 3,197 | 3,197 | 3,150 | 3,150 | 3,150 |
| System Weighted $R^2$ | | 0.23 | | | 0.30 | |