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Benchmarking of Pay Components

in CEO Compensation Design

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by

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Eighty nine percent of S&P500 companies report benchmarking CEO pay components. Analyzing a panel of CEO compensation data of 1,251 S&P 1500 firms during 2007-2013, we find that: 1) Component-of-pay benchmarking explains CEO compensation data better than total compensation benchmarking; 2) the strength of adjustment of compensation components to their benchmarks appears similar across the various components; the only exception is the salary component that adjusts more mildly to its benchmark 3) benchmarking is used not only with respect to the level of compensation components but also with respect to CEO the weight of each pay component in total compensation. We discuss possible motivations for pay component benchmarking.

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Benchmarking of Pay Components in CEO Compensation Design

Abstract

Eighty nine percent of S&P500 companies report benchmarking CEO pay components. Analyzing a panel of CEO compensation data of 1,251 S&P 1500 firms during 2007-2013, we find that: 1) Component-of-pay benchmarking explains CEO compensation data better than total compensation benchmarking; 2) the strength of adjustment of compensation components to their benchmarks appears similar across the various components; the only exception is the salary component that adjusts more mildly to its benchmark 3) benchmarking is used not only with respect to the level of compensation components but also with respect to CEO the weight of each pay component in total compensation. We discuss possible motivations for pay component benchmarking.

1. Introduction

In recent decades, senior executives' compensation has drawn intense academic and non-academic discussions. One issue in these debates 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 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 determining CEO's total compensation.

We extend benchmarking research by analyzing the benchmarking of the components of CEO pay. Is each pay component benchmarked separately and differently than other pay components? We employ two research strategies to answer this question, focusing primarily on the benchmarking of three major pay components: Salary, equity-based compensation, and non-equity performance pay.

First, we read the compensation-committee reports (Form DEF14A) of S&P500 firms in fiscal year 2013, and document any statement about benchmarking CEO pay components. We find that about 89% of the firms explicitly state that they benchmark at least one pay component. About 75% of the firms declare that they benchmark all three major pay components. This means that these firms look separately at the distribution of salary, equity-based compensation, and non- equity-based compensation among peers to determine the level of each pay component to their CEO. We also

examine whether companies target CEO's compensation structure (weight of each pay component in total CEO compensation), and find that about 30% of the companies explicitly declare in their proxy statement that they benchmark the compensation mix.

Our second empirical strategy employs detailed compensation data to examine how well component benchmarking explains the cross-sectional and time series variation in the reported compensation of CEOs. Analyzing a relatively large CEO compensation database, an 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 three important observations. First, we find that component benchmarking describes the data (i.e., describes actual pay practice) better than total compensation benchmarking.

Second, when benchmarking pay components, the adjustments of CEO's salary to that of her selected peers are significantly milder than the adjustments of the two other major pay components (non-equity performance pay and equity pay). We also identify an economically large yet statistically insignificant difference in the adjustment-to-peers coefficient between equity pay and non-equity performance pay.

Third and perhaps most novel, we present evidence supporting the contention that benchmarking is used not only when determining CEO total pay or pay components levels, but also when designing the structure of CEO pay, i.e., the mix between the various components of pay. Boards pay attention to the proportion of each pay component in total pay, and, according to a simple estimate, 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 her peer group.[1]

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[1] We note that benchmarking each component does not necessarily imply that the mix is also benchmarked. For example, data from compensation committee reports show that a common practice is

Our findings regarding the benchmarking of CEO's pay components are somewhat unexpected. According to economic theory, total pay benchmarking helps firms to provide competitive CEO pay packages that serve to retain valuable human capital (Holmstrom and Kaplan 2003). However, competitive pay packages do not explicitly imply benchmarking each pay component separately or benchmarking the mix of CEO compensation.

We discuss potential motivations for pay component benchmarking. Some of these motivations are in line with optimal compensation design. For example, boards may rely on compensation design in other firms, as these designs provide information regarding the optimal compensation structure. However, benchmarking of pay components may also arise from external players' involvement in the process of CEO compensation design (regulators, compensation consultants, proxy advisors, and even directors), and such external interventions may sometimes lead to suboptimal compensation. Examining the motivations behind pay component benchmarking and whether it leads to an optimal compensation design is an important agenda for future research.

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 empirical model of the level of CEO pay components. Section 5 reports and discusses the benchmarking tests' results, Section 6 presents potential motivations for benchmarking pay components and pay structure, and Section 7 summarizes.

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to benchmark components to the median levels of peers. For most distributions this does not imply that the ratio of each component out of total compensation is also benchmarked to the median ratio of peers.

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 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)[2].

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[2] 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 (2020), De Angelis and Grinstein (2020), and Ma, Shin and Wang (2019). Peer groups also play an important role in other corporate policies such as corporate

2.2. The debate over the virtue of benchmarking

The purpose of the benchmarking method is to adjust the level 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 persuade compensation committees to choose peer firms in a way that inflates CEO's pay (Iii, Main, and Crystal, 1988; Main, O'Reilly, and Wade, 1995; Newman and Mozes, 1999).

The pay inflation critique of benchmarking is supported by some studies. 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 bias towards highly paid peers is particularly strong in firms where the peer group is smaller, where the CEO is also the chairman of the board of directors, where the CEO has longer tenure, and where directors are busy 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

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investment, corporate capital structure and financial policies (e.g., Foucault and Fresard, 2014; Leary and Roberts, 2014).

develop a game-theoretic model of the "Lake Wobegon Effect", and show that boards may rationally inflate CEO pay to influence market perception regarding the quality of firm management and value of the firm.

However, the debate about the manipulation of benchmarking is ongoing. Cadman and Carter (2014) do not find evidence for opportunistic selection of peers, while Larcker, McClure and Zhu (2020) 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.

A recent addition to the literature suggests 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. Choosing a more skilled peer group can improve firm performance in two ways: CEOs may be motivated by these highly ranked peers to increase work efforts, and/or CEOs may learn from these presumably excellent peers' policies.

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 than the effect of stock price performance on changes in CEO pay.

The literature reports several 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 CEO 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.

2.4. Pay components' benchmarking

Previous studies focus on the benchmarking on CEO's total pay. However, reviewing DEF14A forms, we find that most firms state that they benchmark each component of total pay. 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 2012 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 2014 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 main pay components may be benchmarked separately and perhaps differently. CEO compensation packages comprise six main components of pay: 1) base salary, 2) bonus, 3) non-equity incentive plan compensation, 4) option grants, 5) restricted stock grants, and 6) other pay. In our empirical work we will consider each of them separately. However, in our central 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 plan compensation), and equity pay (restricted stock and option grants). Dividing the compensation in this way allows us to differentiate both between performance-based components and non-performance-based components and between cash-based components and equity-based components.

When reading DEF14 forms, we notice that many firms also mention benchmarking the peers' compensation structure (mix of pay components). For example, Northeast Utilities declares in its 2014 proxy statement that "We target the mix of compensation for our Chief Executive Officer and the other Named Executive Officers so that the percentages of each compensation element are approximately equal to the competitive median market mix". Motivated by this description, in our empirical work, we examine benchmarking of compensation structure in more detail.

2.5. Hypotheses

2.5.1. 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 benchmarked. Furthermore, we will also examine whether or not all components of pay are benchmarked to the same extent (i.e., using the same adjustment parameters).

2.5.2. Benchmarking of the pay mix

We propose that benchmarking is employed with regards to the structure of CEO pay as well. Prior studies demonstrate the importance of well-designed pay structure. Mehran (1995) argues that a proper structure of pay may motivate managers to increase firm value. He finds that firm performance is positively related to the percentage of executive compensation that is equity-based.

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. The history of CEO pay practices is reviewed in Murphy (2013) and in Edmans, Gabaix and Jenter (2017).

Pay structure is important because it determines the relative magnitude 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 accounting profitability, long-term efficiency, survival or even executive suite coordination (e.g., Guay, Kepler and Tsui, 2019). 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 expect pay structure to be 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. This is especially true when the chosen peer is a relatively successful firm, which partly explains the tendency of compensation committees to choose relatively highly paid CEOs as peers. To the extent that peer firms are comparable firms, or even successful comparable firms, "learning" from the selected

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peers' pay design, including peers' pay mix, appears relevant and prudent for the firm. We discuss this argument in more detail in section 6.

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

Hypothesis 2: 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. Samples and Data

We construct two datasets. The first includes DEF14A forms of all S&P500 firms for fiscal year 2013. This sample will serve to examine company statements about their CEO pay benchmarking policy. The second dataset comprises detailed CEO compensation data for all S&P Composite 1500 firms and their compensation peers in the years 2006-2013. It is intended to examine the actual CEO compensation practices of these firms. For brevity we denote the first sample as the "policy sample" and the second as the "CEO pay practice sample".

3.1. The policy sample

We browse DEF14A forms of S&P 500 firms for fiscal year 2013, looking for information on benchmarking of CEO pay components, benchmarking of CEO total compensation and benchmarking of CEO compensation structure (mix of pay components). In our analysis we focus on three main pay components: salary, non-equity performance pay and equity pay.

First we search the Compensation Discussion and Analysis (CD&A) section of the DEF14A forms for possible information on benchmarking of CEO's total pay and

the pay components. This information is generally located in the chapters describing the executive compensation philosophy and objectives, the pay setting process, components of pay, and peer groups. We use the following keywords: median, 50th, mid-point, percentile, component, element, peer, benchmark, comparator, competitive, and market practice.

Second, we search the DEF14A forms for explicit statements that indicate that firms employ peer group data to determine the mix of CEO's pay components. This information is usually located in the CD&A chapters describing executive compensation philosophy and objectives, peer groups, and the pay mix. We use the keywords: mix, structure, proportion and weight.

Before proceeding we note that for 24 of the 505 firms in our policy sample we do not find any DEF14A forms, and 4 firms use vague statements (for example, a statement that they may consult national compensation surveys.)

Table 1 summarizes our findings. About 75% of the firms state that they benchmark all three pay components, and an additional 14% of the firms explicitly mention that they benchmark one or two of our three main pay components. Thus, in sum, 449 out of the 505 firms we examine, or 89% of the firms, use some form of pay component benchmarking.

In most cases, 383 out of the 449 firms benchmarking pay components, firms benchmark their pay components to the median of the peer group or alternatively no specific target is mentioned even though the firms state that they use peer groups to set the individual pay components. More interestingly, 66 firms, about 13% of the policy sample, explicitly set pay component targets different than the median of their peers.

[Insert Table 1 about here]

Regarding benchmarking CEO's total compensation, 66.5% (or 336) of the firms report they benchmark CEO's total pay in addition to benchmarking CEO's pay components, and an additional 4.8% (24 firms) mention they target total compensation only. Interestingly, the fraction of firms declaring total compensation benchmarking is lower than the fraction declaring pay component benchmarking.

Last, in 154 (30.5%) out of the 505 firms we find an indication that the firm employs the peer group also to determine the mix between the various components of CEO pay. This explicit mentioning of the structure of pay benchmarking appears to support our novel Hypothesis 2, which proposes that CEO pay structure is benchmarked as well.

3.2. The CEO pay practice sample

The initial CEO pay practice 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. Thus, peer group data have become available in definitive proxy statements (DEF14A) for fiscal year 2006. However, since benchmarking requires comparison to previous year data, the first year we examine is 2007.

We focus on executives classified as CEOs by Standard & Poor's ExecuComp database. Compensation data for these CEOs is collected from ExecuComp. 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 component observations with negative values are defined as missing values. We further

drop 2,000 firm-year 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.[3] These data are described in Albuquerque, De Franco and Verdi (2013). We construct peer lists for 1,639 firm-year observations based on Albuquerque et al (2013)'s dataset.

Peer data for 2009-2013 are collected from the ECA database provided by ISS. (ECA is employed also to complement Albuquerque et al. peer list for 2008.) We construct peer lists for 4,884 firm-year observations using the ECA database. Together with the Albuquerque et al. (2013) based list, we attain an explicit list of peers for 6,523 firm-years, 78% of our initial list. The remaining 22% firm-year observations are firms that are missing on ECA.

Next, given our list of peer CEOs, we seek current and prior year compensation data for 112,328 peer firm-year observations. (Thus, there are on average more than 17 peers for each CEO.) We find available compensation data on ExecuComp and ECA for 98,432 peer firm-year 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 the Execucomp or ECA databases.

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

Given available peer and peer compensation data, we exclude 33 disclosing firm-years that report only one or two peers. In addition, we exclude 396 firm-years with missing compensation data for 50% or more of their chosen peers.[4] Last, we exclude 34 observations of Co-CEOs and 1,168 observations of firms in the financial services industry (industries 45-48 in the Fama and French industry classification). Table 2 summarizes the exclusion process. The final sample comprises 4,892 firm-year observations, representing 1,251 unique disclosing firms.

[Insert Table 2 about here]

We collect data on peer-based pay targets from the ECA database when available. The ECA database reports firms' target percentile for three pay measures: salary, bonuses and non-equity incentive plan compensation, and total compensation. For each disclosing firm and compensation component, we calculate the peer-based target pay level based on peers' compensation data and the target pay percentile set by firm's board. Three conventions are used in calculating the target pay level. First, when the ECA dataset does not specify any target percentile, we assume the target equals the median pay of the peers. Second, since ECA does not specify distinct targets for equity pay, we use the total compensation percentile targets to calculate the target pay levels for equity pay, stock awards, and option awards. Last, in cases 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 compensation targets. This statistic corresponds well with our finding in Table 1 that 13% of the firms

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

employ a non-median target for at least one of the pay components. Interestingly, 4% of those non-median targets (23 firm-years) are lower than the median, 92% are in the third quartile (between 0.5 and 0.75), and 4% exceed 0.75.

Regarding the structure of compensation, 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 also common, and it facilitates comparison with previous studies.

Stock return data are from the Center for Research in Security Prices (CRSP) data base. Data on other financial variables (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 possible dual role as CEO and Chairman of the board are collected from the Execucomp database.

3.3. Descriptive statistics for our CEO pay sample

Our final pay data 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 number of peers are consistent with prior studies (e.g. Faulkender and Yang, 2012; Albuquerque, Franco and Verdi, 2013).

Table 3 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 3 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, that 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 $778 thousands.

Target pay measures based on previous year data of 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 peer-based target total compensation is $6,850 ($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 yearly change in total compensation

over the sample period is 8.5%, and it is mainly due to an average annual increase of 9.6% in equity pay that comprises option and stock awards. Other pay components such as salary and non-equity incentive plan compensation increase at an average annual rate of 4% over the sample period.

Changes in pay targets based on peer group data are reported on the right hand 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. Also noteworthy is the mean negative change of 3.8% in peers' "other pay". It warns us that "other pay" may be a residual term that is perhaps less well-controlled or benchmarked. In the main analysis of this study we ignore "other pay".

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 C of Table 3 is 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 discretionary 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-sensitive compensation. The right-hand side of Panel C reports statistics about the target ratios of various pay measures to total compensation, based on peers' compensation data. The compensation

structure of the sample firms is similar to that of the peer firms, consistent with Hypothesis 2 that suggests that pay structure is benchmarked as well.

[Insert Table 3 about here]

Table 4 documents summary statistics for characteristics and explanatory variables that are common in the CEO compensation literature. 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 one-year lagged annual sales revenue as our proxy for firm's size. The average lagged sales is $8,135 million, almost four times the median sales of $2,138 million. This is because, 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 36 months preceding the end of the previous fiscal year, has a mean (median) of 0.11 (0.10). The one-year lagged 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) lagged MTB is 1.82 (1.51). One-year lagged 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, all measured at the end of year t-1. One-year lagged leverage has a mean (median) of 0.35 (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 4 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

$$(1) \ \text{Ln}\big(\text{CEO compensation}_{i,t}\big)$$

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

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

$$+ \alpha_8 \big(\text{Leverage}_{i,t-1}\big) + \alpha_9 \big(\text{CEO Age}_{i,t}\big) + \alpha_{10} \big(\text{CEO Duality Dum}_{i,t}\big)$$

$$+ \alpha_{11} \big(\text{IndustryDum}_{i,t}\big) \times \big(\text{YearDum}_t\big) + e_{i,t} \, ,$$

where i indexes firms and t indexes year. 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 plan compensation; 3) non-equity performance pay – the sum of bonus and non-equity incentive plan 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 the 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 36 months preceding the end of the previous fiscal year (represents firm's risk); lagged market to book (MTB) ratio (a proxy for firm's growth opportunities); lagged 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)'s 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. The traditional compensation model of equation (1) is our baseline model in the rest of the paper.

Table 5 reports the results of estimating equation (1) 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 0.38 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 et al., 2017), the coefficient of Ln ($Sales_{i,t-1}$) is 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 performance pay to ROA (the sum of the coefficients of ROA and one-year lagged ROA) is positive on average, perhaps because non-equity performance pay is typically linked to accounting performance metrics. Interestingly, equity pay and especially option awards are negatively related to ROA. This finding may reflect a cross-sectional

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phenomenon, whereby firms with relatively higher ROAs prefer to grant compensation in the form of non-equity performance pay that is traditionally linked to accounting performance rather than in the form of option awards. This result is consistent with the negative or almost no effect of ROA on CEOs' total compensation documented in previous studies (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 previous studies - see Cohen and Lauterbach (2008) and Faulkender and Yang (2012), for example. Our finding is also in line with Albuquerque, Albuquerque, Carter and Dong (2020), who examine the relation between compensation and risk, and conclude that CEOs with riskier pay packages do not receive an economically large extra compensation.

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. Generally, it is more difficult to monitor CEOs in high growth (high market to book) firms, given that these CEOs make many uncertain future-dependent investment decisions. Hence, growth firms use more equity-based compensation to incentivize their CEOs to exert efforts and make investment decisions that maximize firm value.

As for the other explanatory factors, lagged leverage has a negative and significant effect on equity pay, suggesting that banks and debtholders' 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. Further, consistent with previous studies (e.g., Faulkender and Yang, 2010, 2012), we find that CEOs who serve also as chairmen of their boards receive higher pay.

[Insert Table 5 about here]

Overall, the results are consistent with findings of earlier studies of CEO total compensation. However, we identify some variations in the explanatory power of various factors across pay components. The salary, equity pay and non-equity performance pay components exhibit each some distinctive features.[5] Thus, examining each pay component separately, as we do in this study, sheds additional light on the determinants of CEO pay.

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 6 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-test results are consistent with Hypothesis 1.

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

Both parametric and non-parametric tests indicate that the pay raise gaps between the below- and above-target groups are statistically different from zero at the 1% level for all compensation components. We use t-statistics when comparing mean changes, and Wilcoxon rank sum z-statistics for the non-parametric tests. 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 0.36 (0.07 to 0.21). Among the various pay measures examined, performance pay exhibits the widest average pay gap – 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 CEOs determining their own pay.

[Insert Table 6 about here]

Overall, the results in Panel A of Table 6 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 nine pay and pay components specifications reviewed in Panel A of Table 6 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).

We next examine whether benchmarking is employed also in determining the structure of CEO pay. Each component of pay may induce a different effort scheme from the CEO, hence an optimal pay mix is essential. Our Hypothesis 2 contends that boards turn to comparable firms to gauge the optimal composition of CEO pay.

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

Panel B of Table 6 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 2, 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 regression:

$$(2) \; \Delta \left(\frac{\text{pay component X}}{\text{CEO total compensation}} \right)_{i,t} = \beta_0$$

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

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

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 β_1 in equation (2) 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 6, 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. Moreover, interestingly, the coefficient estimates in Panel C 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. Adding compensation benchmarking to the CEO pay model

Benchmarking focuses on the changes in CEO pay. Thus, we start by differencing the pay component version of our baseline CEO pay model in equation (1), to obtain:

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

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

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

$$+ \beta_8 \Delta\big(\text{Leverage}_{i,t-1}\big) + \beta_9\big(\text{IndustryDum}_{i,t}\big) \times \big(\text{YearDum}_t\big) + \varepsilon_{i,t} \text{ ,}$$

Next, we add to the above equation our benchmarking measures. Bizjak et al. (2011) focus on total CEO pay and define the benchmarking explanatory variable as the natural logarithm of the peer CEOs-based 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 (relative to peers) in their CEO total pay. We use an analogous definition for each pay component, i.e., our first benchmarking explanatory variable for pay component X is the ratio of the peer-based target for pay component X (for example, the median of pay component X among the peers) to the actual level of firm CEO pay component X, both at the previous year.

The second benchmarking variable is novel in the literature and relates to pay structure benchmarking. Our univariate tests in the previous section support the pay structure benchmarking idea (Hypothesis 2). Benchmarking of the pay structure necessarily affects the level of the pay components. For example, if pay component X weight in total compensation is below peer group's median, its adjustment towards the median peer weight requires an increase in the level of pay component X that is separate and supplementary to the other required adjustments of the 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 we have to integrate the benchmarking of the pay component level with the benchmarking of the pay structure, the resulting proposed model for each pay component is:

(4) $\Delta \text{Ln}(\text{CEO compensation component } X_{i,t}) = \beta_0 +$

$\beta_1 \text{Ln}(\text{Relative compensation component } X_{i,t-1}) +$

$\beta_2 \left[\left(\frac{\text{peer pay component X}}{\text{peer total compensation}} \right)_{i,t-1} - \left(\frac{\text{pay component X}}{\text{CEO total compensation}} \right)_{i,t-1} \right] + \beta_3 \Delta \text{Ln}(\text{Sales}_{i,t-1}) +$

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

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

$\beta_{11}(\text{IndustryDum}_{i,t}) \times (\text{YearDum}_t) + \varepsilon_{i,t}$,

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

Table 7 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 component X) are positive and highly statistically significant for all pay components. The magnitude of the coefficients ranges from about 0.07 for salary to 0.32 for performance pay. Thus, 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 0.32% larger (smaller) than that of a CEO whose year t-1 performance pay equals the target performance pay. The adjustment coefficients of the various compensation components in Table 7 tend 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 remains that the gap in

CEO pay component X relative to peers triggers a significant revision (correction towards the peers) in the next year. The results also document that boards adjust CEO pay only partially, which suggests that boards use benchmarking cautiously.

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 all pay components. The coefficient estimates of the weight difference range from a low of 0.027 for salary to a high of 0.47 for option awards. 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 0.45% 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 7 about here]

The results in Table 7 support Hypothesis 2 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 7 also confirms the effects of the relative pay status of the CEO in year t-1 (Hypothesis 1). Thus, in sum, it appears that CEO pay components are adjusted based on two benchmarking criteria: 1) the relative-to-the-peers level of the pay component in the previous year; and 2) the previous year difference in pay component weight in total compensation from its peer group median weight.

It is further interesting to test whether the pay components are benchmarked differently. To test the difference across various pay components in the benchmarking 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 probably exist 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 (4) above. For example, for salary we use:

$$(5)\ \Delta \text{Ln}\big(\text{Salary}_{i,t}\big)$$

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

$$+ \beta_2 \left[\left(\frac{\text{peer's salary}}{\text{peer total compensation}}\right)_{i,t-1} - \left(\frac{\text{CEO's salary}}{\text{CEO total compensation}}\right)_{i,t-1}\right]$$

$$+ \sum_{m=3}^{10} \beta_m \text{Controls}_{m,i} + \beta_{11}(\text{IndustryDum}_{i,t}) \times (\text{YearDum}_t) + \varepsilon_{i,t}$$

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 β_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 8. The coefficients of the SUR estimation are consistent with those reported in Table 7. The differences in the magnitude of the estimated coefficients between tables 7 and 8 are probably due to the decrease in the number of observations in the SUR analysis that excludes firm-years without observations for all three major pay components.

Panel B of Table 8 summarizes the results of F-tests examining cross-components (i.e., cross-equations) differences in the benchmarking coefficients. We find a significant difference in the coefficients when all three pay components are compared. This variation stems from the clearly 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 become somewhat milder.

To further explore the one-million dollars' 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 0.10. This coefficient is statistically significantly higher than the over 900 thousand dollars respective coefficient of 0.065. 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, 0.10, is still markedly lower than the average adjustment coefficient of 0.21 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 Table 8. Perhaps the fact that salary is a "sure" cash pay component causes boards to adjust it more conservatively than the two other uncertain and performance-related pay components.

The differences in adjustment coefficients between equity pay and non-equity performance pay are statistically insignificant. Nevertheless, they are not trivial. For example, the coefficient on the weight difference of pay component X from peer group's median is equal to 0.54 for equity pay and 0.37 for non-equity performance pay. This might indicate some differences between equity and non-equity performance pay that we do not have sufficient statistical power to unveil. (Interestingly, some significant results are obtained in our robustness tests, reviewed in Section 5.4.)

[Insert Table 8 about here]

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 our hypotheses and extend previous evidence on benchmarking.

5.3. 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:

$$(6)\ \Delta Ln\big(\text{Pay component } X_{i,t}\big)$$

$$= \beta_0 + \beta_{1T} Ln\big(\text{Relative total pay}_{i,t-1}\big) + \beta_{1X} Ln\big(\text{Relative pay component } X_{i,t-1}\big)$$

$$+ \sum_{m=2}^{9} \beta_m \text{Controls}_{m,i} + + \beta_{10}(\text{IndustryDum}_{i,t}) \times (\text{YearDum}_t) + \varepsilon_{i,t}$$

Equation (6) allows both total pay and individual component benchmarking. It uses both previous-year relative total pay and previous-year relative pay component as explanatory variables. Under a conservative Null hypothesis (benchmarking of all pay components is identical to that of total pay), the coefficient β_{1X} in equation (6) 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 component-specific 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 when fitting equation (6). This pre-test orthogonalization process makes rejections of the Null even more difficult.

Table 9 presents the results of fitting equation (6) to the three key pay components data using the SUR (Seemingly Unrelated Regressions) methodology. First, as a baseline, we report results of a set of regressions with only the total pay benchmarking variable, and a set of regressions with only individual pay-component benchmarking. Then, we report results of regressions with both total pay and individual pay-component benchmarking variables.

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In Table 9 regressions, the coefficients of both the total pay and pay component benchmarking variables (that are residuals from regressing the component benchmarking criterion on the total pay benchmarking criterion) are positive and statistically significant at the 1% level at least. However, some differences in the explanatory power can be noticed. The system-weighted R^2 of the formulation that includes pay component benchmarking alone, 0.281, is remarkably higher than the system-weighted R^2 of the formulation with only total pay benchmarking (0.219). Evidently, formulations that allow benchmarking at the pay component level describe the data better than the formulation that allows only total pay benchmarking. Further, when both pay component benchmarking and total pay benchmarking are used (in the third set of regressions reported in Table 9), the system weighted R^2 improves only slightly relative to the set of regressions that includes pay components alone (system weighted R^2 increases from 0.281 to 0.282). It appears that pay component benchmarking alone adequately explains the revision in pay component X, i.e., that total pay benchmarking is secondary in the pay benchmarking process.

[Insert Table 9 about here]

More formal tests of the importance of pay component benchmarking can be conducted. The Null hypothesis proposes that in our system of three pay components regressions that includes both individual pay component and total pay benchmarking explanatory variables:

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

These implications of the Null are tested and rejected by the data at the 1% level. Clearly, the actual benchmarking of a pay component is 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.

We also run a set of regressions with total pay and mix of pay benchmarking as explanatory variables. These regressions essentially replace the pay components terms on the right hand side of equation (6) with our pay structure benchmarking variables (deviations of the pay component weight from its peers' median weight). We find that the coefficients of all total pay benchmarking variables and all pay structure benchmarking variables are highly statistically significant, and the system weighted R^2 is 0.270, considerably higher than that of the set of regressions including total pay benchmarking variables only. Evidently, benchmarking of the pay mix is also employed by the compensation committee and the board.

In this context, it may be useful to examine the last set of pay component regressions in Table 9. This last set is copied from Table 8 for comparison convenience. It combines pay component benchmarking with pay structure benchmarking. The interesting finding is that its system weighted R^2, 0.285, is the highest in Table 9, implying that assuming benchmarking of individual pay components and benchmarking of the pay mix are most successful in explaining CEO compensation.[6]

In some sense the tests in this section supplement our main tests, and reinforce our conclusion that separate benchmarking attention is devoted to each key CEO pay component. Further, our evidence may also be interpreted as suggesting that CEO's compensation design is a bottom-up process, advancing from the individual pay components to total compensation.

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[6] We also run a set of regressions with three benchmarking variables: total pay, pay component and pay mix benchmarking. Unfortunately, these regressions are plugged with severe multicoliinearity problems, making it difficult to infer about any benchmarking variable alone.

5.4. Some robustness tests

We conduct several robustness tests on our reported results, trying to remove noise and assist inference. First, we exclude the firm-year observations that had a non-median target for pay components in order to observe the intensity of benchmarking in "regular" firms, i.e., in order to examine whether our results are due to "activist" firms with non-median targets. Re-estimating equation (4), excluding firms with non-median targets, 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, in the SUR analysis, besides the difference between salary and other pay components (previously reported in Table 8), we also identify in this subsample significant differences between the equity pay and non-equity performance pay components. Non-equity performance pay adjusts more vigorously to its relative pay measure (the previous year ratio of firm non-equity performance pay to that of its peers), while equity pay responds more strongly to a "distortion" (relative to peer CEOs) in its weight in total compensation. These findings suggest that in the benchmarking of non-equity performance pay the absolute dollar pay of peers is relatively heavily scaled, while in the benchmarking of equity pay the structure of compensation (weight of equity in total compensation) is relatively heavily scaled.

We further divide our sample into two sub-periods, 2007 - 2009 and 2010 - 2013. Besides examining the temporal stability of the benchmarking coefficients, this test also

explores the effect of the 2009 changes in compensation reporting regulations.[7] Results are similar in the two subperiods, although the $\text{Ln}(\text{Relative pay component}_{i,t-1})$ coefficients appear somewhat lower in the second sub-period.[8] We conclude that the benchmarking behavior of our sample firms appears fairly stable over time.

We also rerun the analysis using firm fixed effects (instead of industry-year fixed effects) to control for possible individual firms' pay patterns. The coefficients of Ln(relative pay component X) tend to increase, while the coefficients on the distance in the proportion of pay component X from peer group's median almost double compared to Table 7. The average Adjusted R^2 across regressions employing firm fixed effect is 0.25 (compared to 0.21 in the industry-year fixed effect version of Table 7). Evidently, the firm fixed effects formulation supports our findings and conclusions.

Another potential criticism concerns the possibility that a compensation component in year t is awarded using a multi-year compensation plan. To monitor the effect of such multi-year grants we add the lagged (year t-1) level of the examined pay component to the list of explanatory variables in our firm fixed effects formulation of the pay component change equation. Bizjak et al. (2011) suggest such a methodology. We find that all of the estimated coefficients of the benchmarking variables remain statistically significant and are even larger in absolute values compared to their counterparts in Table 7. In all of the new fixed-effects pay component regressions, the

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[7] In 2009 the SEC adopted amendments requiring reporting of the aggregate grant date fair value of stock and option awards in the summary compensation table, in accordance with FASB ASC Topic 718, instead of reporting stock and option awards at fair value measured by the amount expensed under FAS 123(R). Fortunately, pre-2009 data comparable to post-2009 measurement of stock and option awards is reported in the plan based awards table of the compensation report. Hence, in the pre-2009 years we use the values from the plan-based awards table.

[8] For example, the coefficient of $\text{Ln}(\text{Relative pay component}_{i,t-1})$ in the performance pay regression decreases from 0.37 in the first subperiod to 0.29 in the second.

coefficient of the lagged compensation variable is significantly negative, and adjusted-R^2s are higher than those reported in Table 7.

Further, one may argue that benchmarking of non-equity performance pay is more complex. According to this argument, when setting the target and criteria for non-equity performance pay, firms do not have even previous year data on peers' non-equity performance pay, since these previous-year payouts are typically based on accounting numbers that are determined relatively late (after the audit of the financial results of year t-1). We re-estimate the non-equity performance pay regression after replacing the benchmarking variable Ln(relative pay component $X_{i,t-1}$) with Ln(relative pay component $X_{i,t-2}$). The coefficient of Ln(relative pay component $X_{i,t-2}$) turns out statistically insignificant.

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 specifications with winsorized control variables (winsorized sales, stock return, ROA, standard deviation, market-to-book, and leverage) at a 2.5% and 97.5% levels. The results are similar, and all conclusions remain intact.

6. Potential Motivations for Pay Component and Pay Structure Benchmarking

Our findings indicate a strong tendency by firms to benchmark each component of CEO compensation separately. Why do firms choose to do so rather than simply benchmarking total compensation? Explanations for benchmarking in the literature have focused on the role of total pay benchmarking in retaining valuable human capital (e.g., Holmstrom and Kaplan 2003). However, these explanations do not predict, for example, benchmarking of the mix of components in CEO compensation. In fact, labor economics literature appears to imply that firms should choose the most efficient

compensation mix among all schemes that provide the same utility to the CEO. Thus, benchmarking of each pay component separately needs to be explained by new economic arguments. In this section we discuss some potential non-mutually-exclusive motivations for benchmarking pay components.

6.1. Extensions of the economic theory of retaining CEOs

Studies such as Oyer (2005) propose that performance-based compensation can be used as a commitment device to retain employees. Vesting requirements provide incentives for employees to stay in the firm and benefit from the expected increase in the stock price. Gibbons and Murphy (1990) and De Angelis and Grinstein (2020) show that relative performance evaluation can also be used as a commitment device to retain CEOs.

Certain components of CEO compensation such as long-term incentive plans or restricted stock grants may have a stronger commitment role than salary or bonuses. Therefore, boards also consider compensation structure when incentivizing CEOs to stay in the firm. This could lead to imitating compensation structures as well as pay component levels in similar companies.

6.2. Unobserved CEO preferences

To a risk-averse CEO, performance-based compensation is worth less than its cost to the shareholders. The discount that CEOs put on options or stock compensation relative to their cost to the shareholders could vary considerably depending on CEO risk aversion (Hall and Murphy, 2002). To the extent that firms cannot fully evaluate the unique risk preferences of their CEOs, they might gravitate to a policy that provides a standard compensation mix structure, similar to the ones in other firms. Copying the

pay structure of similar firms guarantees that their pay is competitive relative to pay of their competitors for managerial talent.

6.3. The effect of compensation consultants

Principal-agent theories (e.g., Holmstrom 1979) assume that the principal knows the relation between compensation design and managerial effort and therefore the principal tailors the optimal compensation structure to optimize CEO actions. However, if the principals do not know the relation between effort, pay and outcome, then they need external help. Compensation consultants usually provide guidance for the optimal design of CEO compensation. They often rely on their own heuristics and understanding, based on information they collect regarding compensation practices in similar companies. It is therefore possible that compensation consultants and their guiding principles contribute to the documented attention to each pay component benchmarking and to the benchmarking of the structure of pay.

6.4. Asymmetric information between shareholders and public companies

In the U.S., as well as in many other countries, shareholders are asked to ratify CEO compensation structure in an annual meeting. This "Say on Pay" procedure emanates from concerns that boards might overcompensate their CEO's or provide incentive structures that do not align CEO's and shareholders' interests. Given the potential conflict of interest and asymmetric information between the board and investors regarding optimal compensation plans, investors are likely to resort to available information regarding plans in other firms to help them decide whether they should vote in favor of the compensation plan. In addition, institutional investors typically use proxy advisory firm recommendations when casting their votes (Larcker, McCall, and Ormazabal, 2015). These proxy advisory firms rely, at least partly, on peer-

firm compensation structure data when evaluating whether CEO's compensation package is adequate. Thus, pay component benchmarking emerges.

6.5. Legal and regulatory systems

Murphy (2013) contends that the legal and regulatory systems have a strong influence on the design and structure of executive compensation. Disclosure rules, tax rules, accounting rules, and other regulations all push firms and directors to adopt certain compensation practices and to abandon others. A well-known example is the 1994 tax rule that allows firms to deduct CEO salary for tax purposes up to $1 million, but allows firms to deduct any amount from the performance-based part of compensation. This was shown to lead firms to keep the salary levels close to the $1 million benchmark and increase the weight of performance-based compensation. It is possible that such rules also push firms towards benchmarking CEO pay components.

For example, Regulation s-k Item 402(b)(2)(xiv) of the SEC states that the compensation committee should address in its compensation discussion and analysis section "..whether the company engaged in any benchmarking of total compensation or any material element of compensation, identifying the benchmark and, if applicable, its components, including component companies". It is possible that the regulator requirements, including the specific citing of "element" (=component) of pay contribute (perhaps even direct) to the decision to benchmark pay components.

6.6. Director reputation and liabilities

Studies have shown that directors are often quite concerned with their reputation (e.g., Jiang, Wan, and Zhao, 2016). Such concerns may lead directors to hedge potential risks of legal and social liabilities. To the extent that directors are worried that particular components of executive compensation might be "outside the norm" and could create

outrage in the media or social network channels, they might tend to align all pay components with their standard levels and proportions at comparable firms.

7. 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 policies and practices of CEO's pay components, based on two samples: the proxy statements of S&P 500 firms for fiscal year 2013, and a relatively large sample of CEO compensation data for S&P 1500 firms (and their peers) in 2007-2013.

We contribute a few important new observations. First, we show that each major pay component is benchmarked on its own, i.e., differently than the benchmarking of total pay. Second, we establish that the adjustment of salary to that of selected peers is significantly milder than the adjustment of non-equity performance pay and equity pay. Last, we find that CEO's pay structure (mix of compensation components) is strongly adjusted towards that of its peer group.

A plausible interpretation of our evidence is that boards of directors recognize that each pay component has its own motivational role, hence it is essential to maintain a proper level of each pay component and a proper balance between all pay components. The board looks at comparable successful firms to learn (imitate) prudent compensation plans. However, it may also be argued that regulators, compensation consultants, proxy advisory firms, directors and shareholders all push towards pay component benchmarking. Future studies should further examine these external motivations and their implications. Some of these motivations might be economically inefficient, hence it is important to study them.

Appendix: Variables' Description

Variable	Description
I. Benchmarking related variables:	
Distance in the proportion of pay component X from peer group median	The difference between the median weight of pay component X in peer firms' total CEO compensation and the corresponding weight at a specific sample firm, both at year t-1.
Ln(relative total compensation)	A benchmark measure defined as the natural logarithm of the peer-group-based total compensation target divided by firm CEO total compensation, both at year t-1.
Ln(relative level of pay component X)	A benchmark measure defined as the natural logarithm of the peer-group-based target level of pay component X divided by firm CEO's level of pay component X, both at year t-1. Sometimes abbreviated as Ln(relative pay component X) or Ln(relative compensation component X)
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. For certain years (2006 in Execucomp and 2006-2008 in ECA), we use Execucomp data item OPTION_AWARDS_FV and ECA variable name OptionGrantsISS. This facilitates consistent measurement and comparability along sample years.

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. For certain years (2006 in Execucomp and 2006-2008 in ECA), we use Execucomp data item STOCK _AWARDS_FV and ECA variable name StockDisclosedGrantDate. This facilitates consistent measurement and comparability along sample years.
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)
Lagged 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-1 end.
Lagged Ln(sales)	The natural logarithm of firm's sales revenue in millions of Dollars in year t-1 (Compustat data item SALE).

Lagged 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 previous fiscal year.
Lagged market-to-book value	The ratio of market value of equity to the book value of equity at year t-1 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: Company policy statements on benchmarking CEO pay

The table summarizes S&P 500 firms' Definitive proxy statements (DEF14A) for fiscal year 2013. The overall sample comprises 505 firms. We browse these firms DEF14A forms for information on three distinctive pay component benchmarking (salary, non-equity performance pay and equity pay), as well as on total compensation benchmarking. The reviewed issues are presented in the form of questions with primarily "Yes/No" answers, and the number of firms in each category as well as its percentage are presented. (Percentages are rounded, thus row total may slightly differ from 100.0%.)

	Number of firms (% of total in parentheses)			
	Yes	No	Missing proxies or vague statements	Only total pay is benchmarked
Are all pay components benchmarked?	378 *(74.9%)*	75 *(14.9%)*	28 *(5.5%)*	24 *(4.8%)*
Does the firm mention benchmarking only one pay component?	33 *(6.5%)*	420 *(83.2%)*	28 *(5.5%)*	24 *(4.8%)*
Does the firm mention benchmarking only two pay components?	38 *(7.5%)*	415 *(82.2%)*	28 *(5.5%)*	24 *(4.8%)*
Does the firm benchmark also the total pay?	336 *(66.5%)*	117 *(23.2%)*	28 *(5.5%)*	24 *(4.8%)*
Does the firm benchmark at least one pay component to a specific target other than the median?	66 *(13.1%)*	387 *(76.6%)*	28 *(5.5%)*	24 *(4.8%)*
Is there an indication of benchmarking the structure (mix) of pay?	154 *(30.5%)*	323 *(64.0%)*	28 *(5.5%)*	-

Table 2: 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
The company did not specify 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 3: 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 peer-based 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	6,850	4,474	5,617	4,869
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	1,161	1,159	836	4,891
Stock awards	2,343	2,528	1,500	4,887	1,936	1,680	1,475	4,887
Non-equity incentive plan compensation	1,296	1,420	881	4,891	1,129	871	941	4,891
Change in pension value and nonqualified deferred compensation earnings	524	1,060	0	4,876	365	696	0	4,876
All other compensation	184	275	79	4,891	140	136	103	4,891
Aggregate pay components								
Performance pay	5,232	4,568	3,869	4,886	5,073	3,518	4,129	4,886
Equity pay	3,692	3,435	2,651	4,887	3,505	2,580	2,845	4,887
Non-equity performance pay	1,436	1,490	984	4,891	1,345	999	1,100	4,891
Other pay	778	1,271	206	4,697	617	825	263	4,697

Table 3- 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	4,780
Change in Ln (salary)	0.042	0.057	0.030	4,866	0.042	0.042	0.038	4,787
Change in Ln (performance pay)	0.11	0.57	0.077	4,769	0.077	0.31	0.065	4,696
Change in Ln (equity pay)	0.096	0.52	0.071	4,333	0.10	0.44	0.078	4,229
Change in Ln (non-equity performance pay)	0.037	0.63	0.038	4,100	0.025	0.53	0.020	4,003
Change in Ln (other pay)	0.019	0.83	0.038	4,697	-0.038	0.57	0.019	4,621

Table 3- *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	4,869
Bonus/Total compensation	0.020	0.066	0	4,869	0.0036	0.022	0	4,869
Option awards/Total compensation	0.17	0.18	0.15	4,869	0.15	0.11	0.16	4,869
Stock awards/Total compensation	0.31	0.22	0.31	4,869	0.26	0.13	0.27	4,869
Non-equity incentive plan compensation/Total compensation	0.19	0.15	0.18	4,869	0.16	0.071	0.17	4,869
<u>Aggregate pay components</u>								
Performance pay/Total compensation	0.71	0.17	0.75	4,869	0.73	0.094	0.75	4,869
Equity pay/Total compensation	0.49	0.21	0.52	4,869	0.49	0.13	0.51	4,869
Non-equity performance pay/Total compensation	0.21	0.14	0.19	4,869				4,869
					0.20	0.070	0.20	
Other pay/Total compensation	0.092	0.12	0.037	4,869	0.072	0.069	0.047	4,869

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Table 4: Descriptive statistics of potential determinants of CEO pay.

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; Lagged sales is the firm's sales revenue in millions of Dollars in year t-1 (Compustat data item SALE); Lagged monthly return standard deviation is the standard deviation of the monthly stock returns in the thirty-six months preceding the end of the previous fiscal year; Lagged market-to-book value is the ratio of market value of equity to the book value of equity at end of year t-1 (Compustat data items [CSHO*PRCC_F+TL+PSTKL-TXDITC]/AT); Lagged 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-1; 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
Lagged sales (in millions of dollars)	8,135	24,612	2,138	4,879
Lagged monthly return standard deviation	0.11	0.050	0.10	4,641
Lagged market-to-book value	1.82	1.08	1.51	4,501
Lagged leverage	0.35	0.20	0.33	4,867
CEO age	56	7	56	4,883
CEO duality	0.16	0.36	0	4,892

Table 5: A baseline model of the level of CEO compensation.

The table reports regression estimates of equation (1). The sample comprises CEOs of S&P 1500 firms in 2007-2013. The dependent variables are the natural logarithm of CEO's 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)'s 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.

	Ln(CEO compensation)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total compensation	Salary	Performance pay	Non-equity performance pay	Equity pay	Stock awards	Option awards
Intercept	4.80***	5.15***	4.48***	3.027***	4.27***	4.32***	3.59***
	(0.23)	(0.10)	(0.27)	(0.27)	(0.33)	(0.30)	(0.39)
Lagged Ln(sales)	0.40***	0.17***	0.45***	0.37***	0.50***	0.44***	0.47***
	(0.017)	(0.0078)	(0.022)	(0.023)	(0.018)	(0.021)	(0.021)
Stock return	0.22***	-0.0058	0.30***	0.47***	0.13***	0.10**	0.18***
	(0.026)	(0.010)	(0.035)	(0.040)	(0.036)	(0.049)	(0.040)
One-year lagged stock return	0.16***	0.0086	0.23***	0.22***	0.11***	0.13***	0.10**
	(0.026)	(0.010)	(0.035)	(0.037)	(0.034)	(0.039)	(0.038)
ROA	0.030	0.12**	0.15	1.51***	-0.38**	-0.092	-0.66***
	(0.12)	(0.057)	(0.18)	(0.29)	(0.18)	(0.23)	(0.20)
One-year lagged ROA	-0.32**	-0.14**	-0.42*	-0.46*	-0.49**	-0.37*	-0.62***
	(0.14)	(0.059)	(0.22)	(0.27)	(0.19)	(0.21)	(0.22)

Table 5- *Continued*

	Ln(CEO compensation)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total compensation	Salary	Performance pay	Non-equity performance pay	Equity pay	Stock awards	Option awards
Lagged Ln(monthly return standard deviation)	-0.14***	-0.017	-0.14**	-0.10	-0.081	-0.12	0.10
	(0.047)	(0.021)	(0.061)	(0.070)	(0.060)	(0.075)	(0.073)
Lagged market-to-book value	0.045**	-0.016	0.044	0.0016	0.12***	0.052	0.20***
	(0.021)	(0.010)	(0.029)	(0.026)	(0.024)	(0.032)	(0.029)
Lagged leverage	-0.14	0.036	-0.27*	0.0032	-0.53***	-0.38**	-0.71***
	(0.12)	(0.057)	(0.15)	(0.18)	(0.17)	(0.19)	(0.19)
CEO Age	0.0030	0.0049***	-0.0035	0.011***	-0.0058*	-0.0040	-0.0039
	(0.0024)	(0.0013)	(0.0031)	(0.0033)	(0.0034)	(0.0041)	(0.0041)
CEO Duality	0.19***	0.10***	0.16***	0.21***	0.11*	0.10	0.15**
	(0.044)	(0.018)	(0.059)	(0.063)	(0.062)	(0.079)	(0.067)
Year × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,255	4,275	4,269	3,839	4,035	3,629	2,701
Adjusted R^2	0.56	0.62	0.47	0.41	0.48	0.38	0.44

Table 6: 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-based target pay and for CEOs who are paid below the peer-based target pay in the previous year. The analysis examines nine forms of CEO pay as follows: total compensation, total compensation excluding the change in pension value, 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 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, while the explanatory variable is the year t-1 distance of pay component weight in total compensation from the median respective weight amongst peer CEOs. Year × Industry FE are dummy variables for each unique combination of industry and year, where industry is based on Fama and French (1997)'s 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 6- *Continued*

Panel A

Mean and median changes in Ln(pay) for CEOs above and below the target pay

Pay measure	Group	Number of observations	Mean change in pay	Median change in pay	p-Values for 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		
Total compensation (excluding change in pension value)	Above target	1,873	-0.087	-0.020	<.0001	<.0001
	Below target	3,019	0.20	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 6- *Continued*

Panel B: Preliminary evidence on the benchmarking of the structure of CEO pay

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 6- *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 7: The effect of benchmarking on the yearly revision in CEO pay components.

The table presents the results of fitting equation (4). 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)'s 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 the 1% level at least in our basic pay components regressions (see Table 5). 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	0.063**	0.18	0.31	0.063	-0.03	0.12***
	(0.029)	(0.18)	(0.22)	(0.23)	(0.20)	(0.011)
Ln(relative level of pay component X)	0.069***	0.32***	0.21***	0.19***	0.19***	0.076***
	(0.0069)	(0.026)	(0.023)	(0.031)	(0.022)	(0.023)
Distance in the proportion of pay component X from its peer group median	0.027***	0.28***	0.25***	0.45***	0.24***	0.47***
	(0.0075)	(0.078)	(0.092)	(0.10)	(0.088)	(0.11)
Change in lagged Ln(sales)	0.038***		-0.18***	0.11**		0.23***
	(0.0057)		(0.070)	(0.053)		(0.068)
Change in stock return		0.10***	0.22***	0.035*		0.053*
		(0.022)	(0.033)	(0.021)		(0.029)

Table 7- *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 one-year lagged stock return		0.086*** (0.031)	0.092** (0.043)	0.028** (0.014)	0.055*** (0.017)	
Change in ROA			1.27*** (0.25)			
Change in lagged ROA						
Change in lagged Ln(monthly return standard deviation)						
Change in lagged market-to-book value				0.064*** (0.018)		0.069*** (0.025)
Change in lagged leverage				-0.49*** (0.14)		-0.68*** (0.21)
Year × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,828	4,683	3,997	3,822	3,467	2,183
Adjusted R^2	0.18	0.31	0.25	0.22	0.18	0.12

Table 8: Variation in benchmarking across the three central pay components.
Panel A presents the results of fitting equation (4) on a system of three 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)'s 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 the 1% level at least in our basic pay components regressions (see Table 5). 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	0.056***	0.084**	0.21***
	(0.0030)	(0.033)	(0.028)
Ln(relative level of pay component X)	0.089***	0.22***	0.19***
	(0.0045)	(0.017)	(0.015)
Distance of pay component X weight from peer group's median weight	0.028**	0.37***	0.54***
	(0.012)	(0.11)	(0.072)
Other explanatory variables as in Table 7	Yes	Yes	Yes
Year × Industry FE	Yes	Yes	Yes
Observations	3,244	3,244	3,244
System Weighted R^2		0.285	

Table 8- *Continued*

Panel B
Examining differences in benchmarking across pay components.

H0: The coefficients of Ln(relative level of pay component X) are equal in the equations of	*F*- statistic	*p*-value
Salary, non-equity performance pay and equity pay	44.33	0.0001
Non-equity performance pay and equity pay	2.14	0.14

H0: The coefficients of Distance from peer group's median weight are equal in the equations of	*F*- statistic	*p*-value
Salary, non-equity performance pay and equity pay	29.54	0.0001
Non-equity performance pay and equity pay	1.65	0.20

Table 9: Tests of the difference in benchmarking between total compensation and pay components.

The table presents the results of fitting equation (6) 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)'s 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 the 1% level at least in our basic pay components regressions (see Table 5). To overcome multicollinearity between relative total compensation and relative pay component X, we first regress each relative pay component X on relative total compensation. Then, we use the residuals of these regressions instead of the relative pay components in the regressions. Standard errors are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 9- *Continued*

	Change in Ln (CEO compensation component X)					
	(1)	(2)	(3)	(4)	(5)	(6)
	Salary	Non-equity performance pay	Equity pay	Salary	Non-equity performance pay	Equity pay
Intercept	0.057***	0.12***	0.14***	0.056***	0.082**	0.19***
	(0.0031)	(0.034)	(0.028)	(0.0030)	(0.033)	(0.029)
Ln(relative total compensation)	0.015***	0.20***	0.37***			
	(0.0020)	(0.022)	(0.018)			
Ln(relative level of pay component X)				0.089***	0.26***	0.26***
				(0.0045)	(0.013)	(0.011)
Other explanatory variables as in Table 7	Yes	Yes	Yes	Yes	Yes	Yes
Year × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,285	3,285	3,285	3,250	3,250	3,250
System Weighted R^2		**0.2192**			**0.2805**	

Table 9- *Continued*

	Change in Ln (CEO compensation component X)					
	(7)	(8)	(9)	(10)	(11)	(12)
	Salary	Non-equity performance pay	Equity pay	Salary	Non-equity performance pay	Equity pay
Intercept	0.058***	0.064*	0.17***	0.056***	0.084**	0.21***
	(0.0030)	(0.033)	(0.029)	(0.0030)	(0.033)	(0.028)
Ln(relative total compensation)	0.012***	0.19***	0.38***			
	(0.0019)	(0.021)	(0.018)			
Ln(relative level of pay component X)	0.094***	0.26***	0.20***	0.089***	0.22***	0.19***
	(0.0051)	(0.014)	(0.016)	(0.0045)	(0.017)	(0.015)
Distance from peer group's median weight				0.028**	0.37***	0.54***
				(0.012)	(0.11)	(0.072)
Other explanatory variables as in Table 7	Yes	Yes	Yes	Yes	Yes	Yes
Year × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,244	3,244	3,244	3,244	3,244	3,244
System Weighted R^2		**0.2820**			**0.2854**	