Benchmarking of Pay Components in CEO Compensation Design

by

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We document an important element of CEO compensation design – benchmarking of the pay components. Analyzing a panel of CEO compensation data entailing 1,451 S&P 1500 firms during 2006-2019, we find that: 1) Component-of-pay benchmarking more effectively explains CEO compensation design than does total compensation benchmarking; 2) Most pay components exhibit similar benchmarking behavior; the only exception is the milder adjustment of salary to that of peers; 3) Benchmarking of the weight of each component in total compensation is also apparent. Our results suggest that benchmarking of pay components is an economically fundamental part of CEO compensation design.

JEL classification: G34, G38, J31, J33, M12, M52

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1. Introduction

In recent decades, senior executives' compensation has drawn intense academic and professional scrutiny. A central issue in these debates is the methodology employed by boards of directors and compensation committees to determine the level and structure of chief executive officer (CEO) pay.

In this study, we focus on the structure of CEO pay, i.e., on the decisions on the levels and relative sizes of the pay components themselves. Extant research on these issues is limited, motivating us to fill the knowledge gap.

We document that benchmarking of both pay-component levels and their mix (to peers' pay component levels and mix) appear as key practical tools in compensation design.

We employ two research strategies (and samples) and focus primarily on the benchmarking of three major pay components: Salary, equity-based compensation (the sum of option awards and stock awards), and non-equity performance pay (the bonus and non-equity incentive plan compensation). First, we read the compensation-committee reports (Form DEF 14A) of S&P 500 firms for fiscal year 2013, about the middle of our sample period, and summarize all statements referring to the benchmarking of CEO pay components. We find that approximately 89% of firms explicitly state that they benchmark at least one pay component. Further, about 75% of firms declare that they benchmark all three major pay components. These figures indicate that these firms examine separately 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 compensation structure (weight of each pay component in total CEO compensation)

and find that approximately 30% of firms explicitly declare in their proxy statement that they benchmark the compensation mix.

Our second empirical strategy employs detailed compensation data to examine how successful is component benchmarking in explaining the cross-sectional and time-series variation in the reported compensation of CEOs. We analyze a relatively large CEO compensation database of 8,128 firm-year observations and 153,862 peer-year observations on 1,451 unique firms included in the S&P Composite 1500 during 2006–2019, and we consequently make several key observations.

First, we find that component benchmarking describes the data, i.e., describes the actual pay practices in our panel data, more effectively than does total compensation benchmarking. Second, when benchmarking pay components, the adjustment of CEO's salary to that of selected peers is significantly weaker than the adjustments of the two other major pay components, non-equity performance pay and equity pay. Third, we present evidence supporting the contention that benchmarking is used not only when determining the CEO pay component levels, but also when designing the structure of CEO pay, i.e., the proportions of the various pay components in total pay. [1]

Our results are interesting also from a theoretical perspective. Theoretical literature motivates total compensation benchmarking as a way to ensure competitive pay and, empirically, total compensation benchmarking is well documented (e.g., Albuquerque et al., 2013; Bizjak et al., 2011; Bizjak et al., 2008; Faulkender & Yang, 2010; Laschever, 2013). However, the competitive pay argument does not necessarily apply for the components of CEO pay. In fact, according to standard agency theory,

[1] We note that benchmarking each pay component does not necessarily imply that the mix of pay components is also benchmarked. For most statistical distributions, benchmarking each component to peers' median does not generate benchmarking of the proportion of each component to the median proportion at firm's peers.

firms should choose the compensation mix that best motivates their CEOs as long as they ensure that total compensation is competitively paid. Moreover, standard agency theory and recent behavioral theories suggest that pay-component mix should be determined by each firm based on the firm-CEO match-specific relations, rather than by peers.[2] Our results suggest that in the tension between the personalized custom-made compensation structure and the market or peer-dictated compensation design, the latter retains a central role.

The rest of the paper is organized as follows. Section 2 offers some background on benchmarking. Section 3 describes the data and the sample construction. Section 4 presents our empirical results, and Section 5 concludes.

2. The Benchmarking Practice

A common practice in the CEO pay-setting process is comparing CEO pay with that of CEOs in peer firms. Firm's peer firms are typically selected based on identical industry, similar size, and a common management talent reservoir (identified by past "flow", sources and destinations, of the firm's executives). In evaluating the CEO pay, pay below the peer median is usually considered as "below market" and interpreted as requiring an upward correction.

The stated purpose of benchmarking is to adjust executive compensation to a competitive level. A senior executive who is compensated improperly may potentially resign from the company or neglect her duties. The benchmarking of CEO compensation, often assisted by external compensation consultants, is a practical and

[2] For example, Holmstrom and Milgrom (1987), point to the following determinants of performance pay: CEO risk aversion, CEO existing holdings in the firm, the relation between CEO effort and performance, CEO disutility from effort, and underlying firm risk. Gervais, Heaton and Odean (2011), point to the level of CEO overconfidence as a determinant of CEO compensation structure.

efficient mechanism to gauge the market wage (Holmstrom & Kaplan, 2003). Benchmarking may be important also because it facilitates setting a fair reward to firm executives. Any perceived unfairness of CEO's compensation package may undermine her intrinsic motivation and damage her reputational incentives (Edmans et al., 2022).

Existing studies have documented that the median of CEO total pay in peer firms helps explain CEO's total pay. Further, the impact of median total pay of peer CEOs on firm CEO total pay exceeds the impact of stock market performance on pay (e.g., Faulkender & Yang, 2010; Bizjak et al., 2011; Albuquerque et al., 2013)[3]. Thus, benchmarking is a key determinant of CEO's pay.

3. Samples and Data

3.1. Company Policy Statements on Benchmarking CEO Pay

We review DEF 14A forms of S&P 500 firms for fiscal year 2013, about the middle of our sample period, to find statements on benchmarking of CEO pay components, benchmarking of CEO total compensation, and benchmarking of CEO compensation structure (mix of pay components). Our analysis focuses 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 DEF 14A forms for information on benchmarking CEO total pay and the pay components. Such information can be found in the chapters describing the executive compensation philosophy and objectives, the pay setting process, components of pay,

[3] A growing strand of literature provides evidence for the role and the effect of peer firms beyond compensation benchmarking. Peer selection also affects relative performance awards (RPE)—see, e.g., Bizjak et al. (2022); De Angelis & Grinstein (2020); and Ma et al. (2021). Peer groups also play an important role in other corporate policies such as corporate investment, corporate capital structure and financial policies (e.g., Foucault & Fresard, 2014; Leary & Roberts, 2014).

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 DEF 14A forms for explicit statements indicating that firms employ peer group data to determine the mix of CEO pay components. This information can be found in the CD&A section of the proxies. We use the following 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 DEF 14A forms. In addition, four firms use vague statements regarding benchmarking, e.g., a statement that they may consult national compensation surveys; hence, we include them in the missing information total count.

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

[Insert Table 1 about here]

Regarding benchmarking CEO total compensation, 66.5% (336) of the firms report benchmarking total CEO pay in addition to benchmarking pay components; an additional 4.8% (24) state they target total compensation only. Interestingly, the fraction of firms declaring total compensation benchmarking, 71%, is lower than the fraction declaring pay component benchmarking, 89%.

Finally, in 154 (30.5%) of the 505 firms, we find statements that the firm also employs the peer group to determine the mix between the various components of CEO pay. This explicit reference to the structure of pay benchmarking suggests that CEO's pay structure may be benchmarked as well.

3.2. The CEO Pay Sample

Our initial sample comprises 23,646 firm-year observations of CEO pay in S&P Composite 1500 index firms during 2006–2019. Data on these CEOs' pay are extracted from Execucomp. On December 2006, the SEC introduced new amendments requiring firms to disclose their peer group when the use of peer groups is material in the pay setting process. Accordingly, almost all firms list their compensation peer groups in definitive proxy statements (DEF 14A) from fiscal year 2006 onwards.

We collect peer list and peer pay data from several sources. Peer information for 2006 through 2008 is based on Albuquerque et al. (2013)'s manually collected data from the Compensation Discussion and Analysis (CD&A) section of the proxy statements.[4] Our peer data for 2009–2013 come from an Executive Compensation Analytics (ECA) database, provided by Institutional Shareholder Services (ISS). Last, peer data for 2014-2019 are collected from the ISS Incentive Lab database.

We exclude: 1) 4,899 firm-year observations of CEOs who were replaced or appointed during the current or previous year (to exclude partial-year compensation or exceptionally high one-time payments such as golden parachutes, severance pay, golden handshakes, and sign-on bonuses); 2) 2083 firm-year observations in the regulated financial-services industry; 3) 505 firm-year observations with no available compensation data for the current and/or previous year; 4) 97 observations with zero values for CEO total compensation; and 5) 54 firms with Co-CEOs. All the above reasons are related to the focal firm and/or its CEO.

We further exclude: 1) 6939 firm years because their peer-firms' lists were not provided in the databases; 2) 895 firm-years because we could not find compensation

[4] We are grateful to Ana Albuquerque and her coauthors for providing us with these data.

data for at least half of their peer CEOs; and 3) 46 firm-years with degenerate peer lists, consisting of only one or two peers. The final sample comprises 8,128 firm-year observations (and 153,862 peer-year observations) on 1,451 unique disclosing firms.[5]

Stock return data are from the Center for Research in Security Prices (CRSP) database. Data on other financial variables (sales, ROA, market-to-book ratio, and financial leverage) that have been found in prior research to explain variations in CEO pay, are extracted from Standard & Poor's Compustat database. Data on the 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 of CEO Pay

The firm-years in our sample are distributed almost uniformly across the 15 years sample period, 2006-2019. Every firm-year observation also includes information concerning the peers. The mean (median) peer group for our firms comprises approximately 25 (20) firms. However, given the missing peer compensation data, the mean (median) number of peers with available compensation data per firm decreases to 19 (16). These mean and median number of peers are slightly higher than those reported in prior studies (e.g., Faulkender &Yang, 2012; Albuquerque et al., 2013).

Table 2 offers descriptive statistics of the annual CEO pay in our sample firms. Panel A of Table 2 describes the pay levels at our focal firms (for brevity, denoted hereafter as firms) and at their peers. Peer pay statistics resemble those of the firm. For example, the mean total compensation of our firm CEOs is 8.16 million dollars, while

[5] 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. Changes in CEO pay are also winsorized at these percentages. Second, we use the logarithm of the pay measures and the logarithmic change of pay. The logarithmic transformation is common, and it facilitates comparison with previous studies.

the mean of the corresponding peer firms' median total compensation is 8.09 million dollars.

[Insert Table 2 about here]

Panel B of Table 2 presents descriptive statistics on the compensation structure. On average, nearly 19% of total CEO compensation is in salary, 3.5% is in discretionary bonuses, 20% is in non-equity incentive compensation, 35% is in stock awards, and 18% is in option awards. (The mean proportions do not add up to 100% primarily because there exists also the "other pay" component.) This evidence shows that U.S. CEOs receive most of their pay in the form of performance-sensitive compensation. The compensation structure of the focal firms is similar to that of their peers.

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

4.1. Univariate Evidence on Benchmarking in CEO Compensation

The benchmarking practice predicts that CEOs with below (peer) median pay in year t-1 receive a pay change in year t that is higher than the respective pay change of CEOs who earn above (peer) median pay in year t-1. Panel A of Table 3 confirms this prediction for both total compensation and its components. Both parametric and nonparametric tests indicate that the pay raise gaps between the below- and above-median CEO groups are statistically different from zero at the 1% level for all compensation components. Note also that the number of observations in the 'below median' groups is generally larger than the number of observations in the 'above median' groups. This difference highlights firms' tendency to select highly paid CEOs as their peers (Faulkender & 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 median' and 'above median'

groups. Also noteworthy, CEOs who earn above the peer group in the previous year receive a pay cut in the following year (with the salary component the only exception). These pay cuts in the 'above median' group appear to challenge the popular view of powerful CEOs determining their own pay.

[Insert Table 3 about here]

We next examine whether benchmarking is also employed in determining the structure of CEO pay. Because each component of pay may encourage the CEO towards a different effort scheme, an optimal pay mix may also be essential. Thus, boards may turn to comparable firms to gauge the optimal composition of CEO pay.

We compute the average year-by-year changes in the weight of various pay components in total compensation for two groups: (i) CEOs whose previous-year weight of pay component X in total compensation is above the previous year peer group median; and (ii) CEOs whose previous-year weight of pay component X in total compensation is below the peer group median in the previous year.

Panel B 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. Evidently, 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 suggest that firms also benchmark CEO's pay structure.

4.2. Benchmarking Effects on CEO Pay

Benchmarking has implications regarding year-to-year changes in CEO pay. We propose the following equation:

(1) $$\Delta \mathrm{Ln}\left(\text{CEO compensation component } \mathrm{X}_{\mathrm{i,t}}\right) = \beta_0 + \beta_1 \mathrm{Ln}\left(\text{Relative compensation component X}_{\mathrm{i,t-1}}\right) + \beta_2 \left[\left(\frac{\text{peer pay component X}}{\text{peer total compensation}}\right)_{i,t-1} - \left(\frac{\text{pay component X}}{\text{CEO total compensation}}\right)_{i,t-1}\right] + \beta_3 \Delta \mathrm{Ln}\left(\mathrm{Sales}_{\mathrm{i,t-1}}\right) + \beta_4 \Delta\left(\text{Stock return}_{\mathrm{i,t}}\right) + \beta_5 \Delta\left(\text{Stock return}_{\mathrm{i,t-1}}\right) + \beta_6 \Delta\left(\mathrm{ROA}_{\mathrm{i,t}}\right) + \beta_7 \Delta\left(\mathrm{ROA}_{\mathrm{i,t-1}}\right) + \beta_8 \Delta \mathrm{Ln}\left(\mathrm{Risk}_{\mathrm{i,t-1}}\right) + \beta_9 \Delta\left(\mathrm{MTB}_{\mathrm{i,t-1}}\right) + \beta_{10} \Delta\left(\mathrm{Leverage}_{\mathrm{i,t-1}}\right) + \beta_{11} (\mathrm{IndustryDum}_{\mathrm{i,t}}) \times (\mathrm{YearDum}_{\mathrm{t}}) + \varepsilon_{\mathrm{i,t}} ,$$

where i indexes firms, X indexes the compensation components, and t indexes years. The other explanatory variables are the changes in variables customary in compensation research such as Sales and Stock return - see the Appendix for variable definitions, and two benchmarking variables, one for the level and one for the structure of pay. Last, the model in Equation (1) also includes industry-year fixed effects.

Regarding the benchmarking variables, Bizjak et al. (2011) focus on total CEO pay and define the level benchmarking variable as the natural logarithm of the median peer CEO total pay divided by the firm's CEO total pay, both at year t-1. The implicit assumption is that the compensation committee and board members try to correct the previous year distortion (relative to peers) in their CEO total pay. We use an analogous definition for each pay component. Therefore, our first benchmarking explanatory variable for pay component X is the ratio of the peer-based median of pay component X to the actual level of firm CEO pay component X, both at the previous year.

The second benchmarking variable, concerning pay structure, is novel in the literature. Benchmarking pay structure necessarily affects the level of the various pay components. For example, if the weight of pay component X in total compensation is below the peer group 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 we chose to represent the 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 for a focal-firm CEO.

Table 4 presents the results of fitting Equation 1 to the data. For brevity, only statistically significant coefficients at the 10% level or higher 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 approximately 0.08 for salary to 0.31 for equity pay. Thus, a CEO with an equity pay 1% below (above) the median peer equity pay in year t-1 receives, ceteris paribus, an equity pay increase in year t that is 0.31% larger (smaller) than that of a CEO whose year t-1 equity pay equals the median peer equity pay. The adjustment coefficients of the compensation components in Table 4 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 (i.e., correction towards the peers) in the next year. The results also document that boards only partially adjust CEO pay, which indicates 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 for all pay components. The coefficients are significant at the 1%, 5% and 10% levels for equity pay, non-equity performance pay and salary, respectively. The coefficient estimates of the weight difference range from a low of 0.016 for salary to a high of 0.15 for equity pay. These coefficients imply, 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 0.15% larger (smaller) than a CEO whose proportion of equity pay is equal 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 0.02% for a CEO whose proportion of salary in total pay is 1% below (above) the peer group median.

Columns 4-6 present the results from estimating Equation 1, using firm and year fixed effects instead of industry-year fixed effects. The coefficients of our two benchmarking measures substantially increase and are almost double the corresponding coefficient values in columns 1-3. All benchmarking coefficients become statistically significant at the 1% level. However, since we are not familiar with previous studies that use firm fixed effects in regressions of the change of pay, we conservatively employ industry-year fixed effects for the rest of our analysis.

[Insert Table 4 about here]

It is interesting to examine the difference in the benchmarking coefficients across the main pay components. For this task we employ the seemingly unrelated regressions (SUR) methodology, because: (i) it achieves more efficient estimation[6]; and (ii) it affords testing restrictions on parameters from several pay component equations.

The equation system we use comprises the three major pay components: salary; non-equity incentive; and equity pay. For each component we use the model specified in Equation 1 above. For example, for salary we use:

[6] The residuals of the pay component regressions may be correlated, due to common unobserved factors that influence all pay components.

(2) $$\Delta \mathrm{Ln}(\mathrm{Salary}_{i,t}) = \beta_0 + \beta_1 \mathrm{Ln}(\mathrm{Relative\ salary}_{i,t-1}) + \beta_2 \left[\left(\frac{\text{peer's salary}}{\text{peer total compensation}} \right)_{i,t-1} - \left(\frac{\text{CEO's salary}}{\text{CEO total compensation}} \right)_{i,t-1} \right] + \sum_{m=3}^{10} \beta_m \mathrm{Controls}_{m,i} + \beta_{11} (\mathrm{IndustryDum}_{i,t}) \times (\mathrm{YearDum}_t) + \varepsilon_{i,t}$$

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, we 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 5. The coefficients of the SUR estimation are slightly higher than those reported in Table 4. This difference is probably due to the fact that the SUR analysis excludes firm-years with a missing or a zero observation for one or more of our three major pay components.

Panel B 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. The source of this result is the weaker benchmarking of CEO's salary. We do not find statistically significant differences between equity pay and non-equity performance pay.

One explanation for the less pronounced adjustment of the salary component is that the salary compensation was subject to the one-million-dollar tax deductibility rule. Thus, firms approaching the one million dollars' cap from below may find adjusting their CEO base salary at the same rate as other components of pay to be more costly. Consequently, pay adjustments of salary become less pronounced.

To further explore the one-million-dollar cap explanation, we generate a dummy variable that equals 1 when CEO's previous year base salary is below 900 thousand dollars, and zero otherwise. Presumably, CEOs with a salary below 900 thousand dollars are less restricted by the one-million-dollar salary cap regulation. This dummy variable is then interacted with the benchmarking measure, $Ln(Relative\ salary_{i,t-1})$. 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 0.08.

The amended adjustment coefficient for the subsample of below 900 thousand dollar salary, 0.1, is still markedly lower than the adjustment coefficient of about 0.3 estimated for equity pay and non-equity performance pay. We conclude that the one-million-dollar cap cannot adequately explain the considerably lower magnitude of adjustment of the salary component documented in Table 5. It is also possible that the fact that salary is a “sure” cash pay causes boards to adjust it more conservatively than the two other uncertain and performance-related pay components.

[Insert Table 5 about here]

4.3. Are Pay Components Benchmarked Differently from Total Pay?

This study analyses each pay component separately. However, it is possible to argue that only total compensation is benchmarked, and the pay component levels are consequential, i.e., adjusted later according to their proportion in total pay. We can directly test the proposition that pay components are benchmarked independently from total compensation by fitting the following model:

(3) $$\Delta \mathrm{Ln}\left(\text{CEO compensation component } \mathrm{X}_{\mathrm{i,t}}\right) = \beta_0 + \beta_{1\mathrm{T}} \mathrm{Ln}\left(\text{Relative total compensation}_{\mathrm{i,t-1}}\right) + \beta_{1\mathrm{X}} \mathrm{Ln}\left(\text{Relative compensation component } \mathrm{X}_{\mathrm{i,t-1}}\right) + \sum_{m=2}^{9} \beta_{\mathrm{m}} \mathrm{Controls}_{m,i} + \beta_{10}(\mathrm{IndustryDum}_{\mathrm{i,t}}) \times (\mathrm{YearDum}_{\mathrm{t}}) + \varepsilon_{\mathrm{i,t}}$$

Equation 3 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 (all pay components are benchmarked identically to total pay), the coefficient $\beta_{1\mathrm{X}}$ in Equation 3 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, to avoid distortions due to multicollinearity, we regress *Relative compensation component* $X_{i,t-1}$ on *Relative total compensation* $_{i,t-1}$, and use the residual of this regression instead of *Relative compensation component* $X_{i,t-1}$ when fitting Equation 3. This pre-test orthogonalization makes rejections of the null even more difficult.

Table 6 presents the results of fitting Equation 3 to the three key pay components data using the SUR 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.

In Table 6, the coefficients of both the total pay and pay component benchmarking variables are positive and statistically significant at the 1% level at least. However, the system-weighted R^2 of the formulation that includes pay component benchmarking alone, 0.3065, is remarkably higher than that of the formulation with

only total pay benchmarking, 0.2238. Further, when both pay component benchmarking and total pay benchmarking are used (in the third set of regressions in Table 6), the system weighted R^2 improves only slightly—from 0.3065 to 0.3069—relative to the set of regressions employing pay components alone. Pay component benchmarking alone seems to adequately explain the revision in pay component X, i.e., total pay benchmarking appears secondary in the pay component setting process.

[Insert Table 6 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, each pay component receives special attention, i.e., benchmarking on its own.[7]

The last set of pay component regressions in Table 6 is copied from Table 5 for comparison convenience; it combines pay component benchmarking with pay structure benchmarking. Notably, its system weighted R^2, 0.3071, is the highest in Table 6, suggesting that benchmarking of individual pay components plus benchmarking of the pay mix are the most successful explanation for CEO compensation.[8]

[7] We also run a set of regressions with total pay and pay structure benchmarking as explanatory variables. These regressions essentially replace the pay component benchmarking terms on the right-hand side of Equation 3 with our pay structure benchmarking variables, the deviations of the pay component weight from its peers' median weight. All benchmarking coefficients in these regressions are statistically significant, yet the system weighted R^2, 0.2785, is low relative to that of benchmarking pay components alone. Hence, the results are not reported in Table 6.

[8] We also run a set of regressions with three benchmarking variables: total pay; pay component; and pay mix benchmarking. However, these regressions are plugged with severe multicollinearity problems that obstruct any inference regarding any single benchmarking variable.

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 to indicate that CEO compensation design is a bottom-up process, which builds from the individual pay components to total compensation.

4.4. Robustness Tests

We conduct several robustness tests on our results. First, a possible concern is that firms that do not use all available pay components when compensating their CEOs introduce some noise. When confining the sample to firm-years with non-zero values for all pay components, we find slightly higher coefficients for all our benchmarking variables in Table 3 regressions, suggesting that our results are not driven by firms that omit certain pay components.

Another concern is that in many cases the compensation component in year t is awarded based on a multiyear compensation plan. To monitor the effect of such multiyear grants we add the lagged (year t-1) level of the examined pay component to the list of explanatory variables in our industry-year fixed effects formulation of the pay component change equation; this methodology is proposed in Bizjak et al. (2011). The estimated coefficients of our first benchmarking variable - *Relative compensation component* $X_{i,t-1}$ drop to 0.19 (0.26) in the non-equity performance (equity) pay regression of Table 3. However, all the coefficients of the benchmarking variables remain statistically significant. In the new pay component regressions, the coefficient of the lagged compensation variable is significantly negative, and adjusted R^2s are higher than those reported in Table 3.

We also replicate the main tests using two-digit SIC codes instead of the Fama and French (1997) 49-industries and find similar results. Last, we re-estimate the regressions confining the sample to S&P 900 firms. The estimated coefficients on the benchmarking variables are slightly attenuated, suggesting somewhat stronger adjustments to peer pay in small-cap companies.

5. Summary

Compensation benchmarking is an important and prevalent tool in setting CEO pay. Using a relatively large data set of 8,128 firm-year observations (and 153,862 peer-year observations) on S&P 1500 firms in 2006-2019, we contribute three new empirical observations. First, we show that pay component benchmarking describes company policies and actual pay practices better than total compensation benchmarking. Second, we identify intra-pay-component differences - the adjustment of salary to that of selected peers is significantly less pronounced than the corresponding adjustments of non-equity performance pay and equity pay. Third, we present some evidence that companies also adjust CEO's pay structure (mix of compensation components) towards that of its peer group.

The use of pay component benchmarking is not theoretically obvious. Standard agency models predict total compensation benchmarking to ensure competitive pay but they also predict that the mix of compensation components should be tailored according to CEO-firm specific needs. A plausible interpretation of our evidence is that boards of directors recognize that each pay component has its own role in motivating the CEO to stay with the firm and/or that each pay component elicits a different sort of effort. The board might look at comparable successful firms as models for prudent compensation plans and might employ these companies as compensation peers.

There could be also other explanations for the phenomenon. For example, benchmarking of pay components might also inefficiently arise from external players' (regulators, compensation consultants, and proxy advisors) involvement in the process of CEO compensation determination. In this study we have not examined the exact purpose of each pay component and essentially the reason for benchmarking a pay component rather than total pay. Future research should explore possible reasons for pay component benchmarking.

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, and ECA variable name OtherAnnualCompensation.
Bonus	Execucomp data item BONUS, and ECA variable name AnnualBonus.
Equity pay	The sum of option awards and stock awards.
Non-equity incentive plan compensation	Execucomp data item NONEQ_INCENT, and ECA variable name NonEquityIncentivePayout.
Non-equity performance pay	The sum of bonus and non-equity incentive plan compensation.
Option awards	Execucomp data item OPTION_AWARDS, and ECA variable name OptionAwards. 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, and ECA variable name DisclosedSalary.
Stock awards	Execucomp data item STOCK_AWARDS, and ECA variable name StockAwards. 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, and ECA variable name DisclosedTotalCompensation.
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' compensation benchmarking policies, as disclosed in their proxy statements (DEF 14A) for fiscal year 2013. The overall sample comprises 505 firms. Pay components are salary; non-equity performance pay; and equity pay.

Panel A: Benchmarking statements

The benchmarking statements in company proxy regard					
At least one pay component	All three pay components	Only two pay components	Only one pay component	Total compensation	Missing or vague statements
449	378	38	33	336	28
88.9%	74.9%	7.5%	6.5%	66.5%	5.5%

Panel B: Other relevant benchmarking information

Benchmarking of			
The structure of compensation	Pay components using non-median targets	Only total compensation	Only pay components
154	66	24	113
30.5%	13.1%	4.8%	22.4%

Table 2: Descriptive Statistics of CEO Pay and Its Components.

The sample comprises CEOs of S&P 1500 firms in 2006–2019. Panel A reports descriptive statistics for CEO actual pay and peer CEOs' median pay. All compensation figures are in thousands of dollars. Panel B reports descriptive statistics for the weight of various compensation components in total compensation at the focal firms, as well as the respective weights based on peer compensation data in the previous year. 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 focal firms				Median peers' compensation			
Total compensation	8,158	6,106	6,563	7,848	8,090	4,664	7,182	7,848
Salary	958	338	945	7,884	974	270	974	7,884
Bonus	97	351	0	7,884	12	103	0	7,884
Option awards	1,348	1,822	661	7,883	1,130	1,160	831	7,883
Stock awards	3,265	3,304	2,280	7,879	3,046	2,381	2,493	7,879
Non-equity incentive plan compensation	1,558	1,615	1,125	7,882	1,388	962	1,235	7,882
Change in pension value and nonqualified deferred compensation earnings	555	1,141	0	7,855	338	707	0	7,855
All other compensation	209	301	96	7,881	148	129	116	7,881
Aggregate pay components								
Equity pay	4,728	4,152	3,626	7,879	4,661	3,072	4,026	7,879
Non-equity performance pay	1,693	1,670	1,233	7,882	1,558	1,058	1,348	7,882

Panel B: CEO compensation structure

	Mean	Std. dev.	Median	N	Mean	Std. dev.	Median	N
	Compensation structure at focal firms				Compensation structure at chosen peers			
Salary/Total compensation	0.19	0.13	0.15	8,099	0.15	0.069	0.14	8,099
Bonus/Total compensation	0.035	0.10	0.00	8,099	0.014	0.051	0.00	8,099
Option awards/Total compensation	0.18	0.22	0.14	8,099	0.15	0.118	0.15	8,099
Stock awards/Total compensation	0.35	0.31	0.33	8,099	0.325	0.182	0.33	8,099
Non-equity incentive plan compensation/Total compensation	0.20	0.15	0.18	8,098	0.17	0.067	0.18	8,098
Aggregate pay components								
Equity pay/Total compensation	0.54	0.36	0.55	8,099	0.54	0.15	0.56	8,099
Non-equity performance pay/Total compensation	0.23	0.15	0.20	8,098	0.20	0.07	0.19	8,098

Table 3: Preliminary Evidence on Benchmarking in CEO Compensation and Its Components.

The sample comprises CEOs of S&P 1500 firms in 2006–2019. Panel A reports changes in CEO pay from year t-1 to year t. It shows the mean and the median logarithmic changes in pay for CEOs who are paid above the peer group median pay and CEOs who are paid below the peer group median in the previous year. The Wilcoxon signed rank-sum test and t-test are used to assess statistical significance for differences in the median and mean, respectively. Panel B focuses on the changes in the weight of various pay components in total compensation from year t-1 to year t, comparing CEOs whose pay component weight in total compensation was above the peer group median in the previous year with those whose pay component weight in total compensation was below the peer group median in the previous year. Definitions of all variables appear in the Appendix.

Panel A: Mean and median changes in Ln(pay) for CEOs above and below their peers' median pay

Pay measure	Group	Number of observations	Mean change in Ln (pay)	Median change in Ln (pay)	*p*-Values for difference	
					t-Test	Wilcoxon test
Total compensation	Above median	3,390	-0.086	-0.032	<.0001	<.0001
	Below median	4,672	0.21	0.15		
Total compensation (excluding the pension deduction)	Above median	3,453	-0.090	-0.016	<.0001	<.0001
	Below median	4,675	0.20	0.14		
Salary	Above median	3,463	0.025	0.019	<.0001	<.0001
	Below median	4,603	0.051	0.037		
Non-equity performance pay	Above median	3,660	-0.10	-0.029	<.0001	<.0001
	Below median	3,309	0.21	0.16		
Equity pay	Above median	3,431	-0.067	0.00041	<.0001	<.0001
	Below median	3,884	0.23	0.14		

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

Pay measure	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	Median change in the weight of the pay component	*p*-value of the change (based on a *t*- test)
Salary	Above median	4,503	0.24	-0.037	-0.018	<.0001
	Below median	3,559	0.12	0.025	0.006	
Non-equity performance pay	Above median	4,235	0.32	-0.068	-0.048	<.0001
	Below median	3,825	0.12	0.054	0.020	
Equity pay	Above median	3,926	0.71	-0.074	-0.029	<.0001
	Below median	4,136	0.37	0.11	0.046	

Table 4: The Effect of Benchmarking on the Yearly Revision in CEO Pay Components.

The table presents the results of fitting Equation 1. The sample comprises CEOs of S&P 1500 firms in 2006-2019. 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 the 49-industries classification of Fama and French (1997). Note that for each of our three main pay components, 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 the Online Appendix). 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)					
	Industry × Year fixed effects			Firm and year fixed effects		
	(1)	(2)	(3)	(4)	(5)	(6)
	Salary	Non-equity performance pay	Equity pay	Salary	Non-equity performance pay	Equity pay
Intercept	0.081**	0.080	0.16***	0.055***	0.37***	0.32***
	(0.037)	(0.12)	(0.025)	(0.0038)	(0.038)	(0.042)
Ln(relative level of pay component X)	0.079***	0.28***	0.31***	0.15***	0.48***	0.53***
	(0.006)	(0.015)	(0.015)	(0.010)	(0.024)	(0.019)
Distance in the proportion of pay component X from its peer group median	0.016*	0.15**	0.10***	0.034***	0.30***	0.16***
	(0.0081)	(0.06)	(0.030)	(0.011)	(0.088)	(0.034)
Change in lagged Ln(sales)	0.050***	-0.18***	0.19*	0.022***	-0.23***	
	(0.0055)	(0.054)	(0.047)	(0.0054)	(0.064)	
Change in stock return		0.35***	0.039***		0.30***	
		(0.021)	(0.017)		(0.022)	
Change in one-year lagged stock return		0.20***			0.21***	0.042***
		(0.018)			(0.019)	(0.016)
Change in ROA		1.73***			1.84***	
		(0.17)			(0.19)	
Change in lagged ROA				0.029**		
				(0.013)		
Change in lagged market-to-book value			0.055***			
			(0.021)			
Change in lagged leverage			-0.49***			-0.46***
			(0.13)			(0.11)

Table 4- ***Continued***

	Change in Ln (CEO compensation component X)					
	Industry × Year fixed effects			Firm and year fixed effects		
	(1)	(2)	(3)	(4)	(5)	(6)
	Salary	Non-equity performance pay	Equity pay	Salary	Non-equity performance pay	Equity pay
Year × Industry FE	Yes	Yes	Yes	No	No	No
Firm FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes
Observations	7,967	6,767	6,469	7,967	6,767	7,097
Adjusted R^2	0.182	0.290	0.223	0.289	0.310	0.300

Table 5: Variation in Benchmarking Across the Three Main Pay Components.

Panel A presents the results of fitting Equation 1 on a system of three key pay components (salary, non-equity performance pay, and equity pay) using seemingly unrelated regressions (SUR). 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 2006-2019. 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 the 49-industries classification of Fama and French (1997). 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 Online Appendix). Standard errors are reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Results from fitting Equation 1 using seemingly unrelated regressions.

	Change in Ln (CEO compensation component X)		
	(1)	(2)	(3)
	Salary	Non-equity performance pay	Equity pay
Intercept	0.052***	0.21***	0.033
	(0.0028)	(0.030)	(0.026)
Ln(relative level of pay component X)	0.10***	0.29***	0.32***
	(0.0037)	(0.014)	(0.011)
Distance of pay component X weight from peer group's median weight	0.016*	0.18**	0.11***
	(0.0093)	(0.074)	(0.030)
Other explanatory variables as in Table 4	Yes	Yes	Yes
Year × Industry FE	Yes	Yes	Yes
Observations	5,623	5,623	5,623
System Weighted R^2		0.3071	

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	249.31	0.0001
Non-equity performance pay and equity pay	3.46	0.063
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	6.47	0.0016
Non-equity performance pay and equity pay	0.97	0.33

Table 6: Tests of the Difference in Benchmarking Between Total Compensation and Pay Components.

The table examines various benchmarking combinations in a system of the three main pay components (salary, non-equity performance pay, and equity pay) using seemingly unrelated regressions. The sample comprises CEOs of S&P 1500 firms in 2006–2019. Definition of all variables are provided in the Appendix. Year × Industry FE are dummy variables for each unique combination of industry and year based on the 49-industries classification of Fama and French (1997). 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 Online Appendix). 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.

	Change in Ln (CEO compensation component X)					
	(1) Salary	(2) Non-equity performance pay	(3) Equity pay	(4) Salary	(5) Non-equity performance pay	(6) Equity pay
Intercept	0.055***	0.22***	0.041	0.052***	0.20***	0.033
	(0.0030)	(0.032)	(0.027)	(0.0028)	(0.030)	(0.026)
Ln(relative total compensation)	0.014***	0.18***	0.33***			
	(0.0015)	(0.017)	(0.014)			
Ln(relative level of pay component X)				0.095***	0.31***	0.34***
				(0.0036)	(0.011)	(0.010)
Other explanatory variables as in Table 4	Yes	Yes	Yes	Yes	Yes	Yes
Year × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,667	5,667	5,667	5,642	5,642	5,642
System Weighted R^2		**0.2238**			**0.3065**	

Table 6- ***Continued***

	Change in Ln (CEO compensation component X)					
	(7) Salary	(8) Non-equity performance pay	(9) Equity pay	(10) Salary	(11) Non-equity performance pay	(12) Equity pay
Intercept	0.055***	0.18***	0.032	0.052***	0.21***	0.033
	(0.003)	(0.030)	(0.026)	(0.0028)	(0.030)	(0.026)
Ln(relative total compensation)	0.012***	0.16***	0.34***			
	(0.0015)	(0.016)	(0.013)			
Ln(relative level of pay component X)	0.10***	0.33***	0.34***	0.10***	0.29***	0.32***
	(0.004)	(0.012)	(0.014)	(0.0037)	(0.014)	(0.011)
Distance of pay component X weight from peer group's median weight				0.016*	0.18**	0.11***
				(0.0093)	(0.074)	(0.030)
Other explanatory variables as in Table 4	Yes	Yes	Yes	Yes	Yes	Yes
Year × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,623	5,623	5,623	5,623	5,623	5,623
System Weighted R^2		**0.3069**			**0.3071**	