Measurement of Executive Compensation in Mandated SEC Disclosures: Implications for the CEO Pay Ratio

Brian Bratten
Gatton College of Business & Economics
University of Kentucky
brian.bratten@uky.edu

Adam Manlove
Kelley School of Business
Indiana University
amanlove@iu.edu

Casey Schwab
Ryan College of Business
University of North Texas
casey.schwab@unt.edu

Bridget Stomberg
Kelley School of Business
Indiana University
bstomber@iu.edu

April 2021

Acknowledgements

The authors are grateful to workshop participants at the University of Kentucky and Murray State University for helpful comments. Bratten acknowledges financial support from the Institute for the Study of free Enterprise and the Gatton College of Business and Economics. Schwab gratefully acknowledges funding from the G. Brint Ryan Chair of Accounting. Stomberg gratefully acknowledges financial support from the Weimer Faculty Fellowship. We thank Anh Pham and Valbona Sulcaj for providing research assistance. We especially thank Brian Williams for valuable discussions and suggestions.

Measurement of Executive Compensation in Mandated SEC Disclosures: Implications for the CEO Pay Ratio

Abstract

The SEC has tried to increase the transparency of executive pay in recent years. For example, since 2006, publicly traded companies must disclose information about both the value of compensation *reported* in accounting earnings during the year based on amounts granted to named executive officers and information related to the value of compensation *realized* by the executive officers during the year. However, the SEC emphasizes reported pay. Using a sample of CEO-years from 2006-2019, we quantify the difference between realized and reported pay and identify factors that explain this difference. On average, reported and realized pay differ by $3.6 million (57 percent of the reported amount) with realized pay exceeding reported pay by an average of $980,000 (15.5 percent of reported pay). We predict and find that deviations between realized and reported compensation vary with characteristics of the CEO's compensation package, firm performance, complexity in estimating reported amounts, and managerial discretion over valuation model inputs. Finally, we analyze the sensitivity of the CEO pay ratio to using reported versus realized amounts. We find that the ratio would change by more than 50 percent for the vast majority of the sample if computed using realized amounts. Our results caution against a one-size fits all approach to measuring executive compensation. Stakeholders should exercise care when relying on reported pay amounts to assess firms' pay practices.

I. Introduction

Over the last fifteen years, the Securities and Exchange Commission (SEC) has enacted regulations to improve the transparency and accountability of public firms' executive compensation practices. These regulations include the Executive Compensation and Related Person Disclosure (SEC 2006), Say-on-Pay (SEC 2011), and the Pay Ratio Disclosure regulations (SEC 2015). The media and watchdog groups use these disclosures to highlight the steady rise of CEO pay (CBS News 2019; Baker, Bivens, and Schieder 2019) and the often extreme discrepancy between executive and employee pay (Stebbins 2019). These disclosures also serve as the base for state and local surtaxes on companies with high CEO pay ratios (Center on Executive Compensation 2020) and recent federal legislation that proposes linking the corporate tax rate to the CEO pay ratio. Despite widespread focus on *reported* pay, there is limited evidence on how well it reflects *realized* executive compensation. We estimate the difference between realized and reported CEO pay and identify factors that explain the difference. In doing so, our study informs users relying on reported values to assess executive compensation and highlights the sensitivity of the pay ratio to how CEO compensation is measured.

The SEC requires public companies to provide information about the value of compensation granted to executives (i.e., reported compensation) during the year as well as the value of compensation realized during the year. Although both measures are disclosed in Proxy Statements, reported compensation receives the greatest emphasis in SEC disclosures. The SEC refers to the Summary of Annual Compensation Table, which discloses reported compensation, as the "principal disclosure vehicle regarding executive compensation." It is often the first table

in the Compensation Discussion and Analysis and the only one to provide a summary compensation amount. In addition, the SEC chose reported pay to compute the CEO pay ratio.

Although we make no claims about which measure is *better*, there are practical implications of the measures differing substantially.[1] Stakeholders using reported amounts or the pay ratio to evaluate companies' pay practices should understand how well these metrics reflect a CEO's realized compensation and differences in compensation between executives and rank-and-file employees. For example, lawmakers trying to mitigate income inequality by taxing companies with high CEO pay ratios might consider basing the tax on realized compensation, which ties more closely to earned income and measures of income inequality. Doing so would help ensure the tax burden is borne by companies with CEOs who take home the most pay and could curb incentives for managers to understate reported compensation to avoid tax. Moreover, large discrepancies could motivate the SEC to require firms to increase the salience of realized pay disclosures and discuss large differences between reported and realized compensation. Such requirements could mitigate managers' incentives to understate reported pay to avoid scrutiny and reduce the reported CEO pay ratio.

We begin by examining differences in current year reported and realized CEO compensation. We subtract reported pay from realized pay, such that positive (negative) differences indicate that reported amounts understate (overstate) CEO's realized compensation. Positive (negative) differences also suggest the disclosed CEO pay ratio is likely understated (overstated) when compared to pre-tax take-home pay. We scale the pay difference by reported

[1] Some argue reported values are more appropriate because they better match the compensation from options and performance-based shares to the period they are earned (e.g., ratably over the vesting period) rather than when they are exercised. This feature is particularly salient when CEOs exercise or vest compensation earned over multiple years at one time (Core et al. 2008). However, others argue that what the CEO "takes home, puts in the bank, and on which he or she is obligated to pay income taxes" is more relevant (Lazonick and Hopkins 2016).

pay to obtain a relative measure of differences. We identify systematic and predictable deviations across firm years to inform stakeholders using CEO pay disclosures.

We document wide variation in both the sign and magnitude of differences between realized and reported CEO pay. In dollars, the absolute value of the pay difference averages approximately $3.6 million (59 percent of reported pay), with realized amounts exceeding reporting amounts by $980 thousand (15.5 percent of reported pay) on average. Average realized pay exceeds reported pay every year except in 2009 during the financial crisis. However, the median difference is negative and equals approximately −$217 thousand or −4.8 percent of median reported pay per year. Thus, it is difficult to generalize how these two measures compare across firm years. Moreover, these two measures diverge significantly for a non-trivial portion of the sample. For approximately 32 (10) percent of the sample, the absolute pay difference exceeds 50 (100) percent of reported amounts.

We use pooled regression analysis to examine the impact of four groups of factors we predict will be associated with the absolute value of the pay difference scaled by reported pay (hereafter, absolute pay difference). We first examine factors related to CEO pay structure. We expect the percentage of compensation derived from stock-based pay, particularly options, to be positively associated with the absolute value of the absolute pay difference because share-based pay is the underlying source of differences between reported and realized amounts. We also consider reductions in the extent to which a CEO's pay is derived from share-based compensation, and particularly stock options. Because a CEO demands greater compensation when paid in options (due to greater downside risk), a shift from options to other share-based pay will decrease a CEO's current reported compensation while not affecting realized compensation, which is a function of prior year awards. To capture these changes, we identify year-over-year

shifts from options to restricted stock. Moreover, a CEO with no share-based awards in the current year will have less reported compensation but may still exercise and vest in awards from prior years. Thus, we expect both of these features of the CEO's pay package to be positively associated with the absolute pay difference. Relatedly, we consider the CEO's tenure and departure from the firm. Because of time lags between the grant and realization of share-based awards, we expect a positive association between CEO tenure and the absolute pay difference. We also expect greater differences in the CEO's final year when reported compensation is likely to be lower and realizations higher because of the CEO's departure.

Second, we examine the effect of firm performance measured using both accounting profitability and returns. Each of these factors can affect reported, realized amounts, or both. We expect a positive association between performance and the absolute pay difference because the realized value of share-based compensation increases (decreases) for firms exhibiting stronger (weaker) firm performance, increasing the potential for realized compensation that exceeds (is less than) reported compensation. Third, we examine factors that contribute to complexity to ascertain whether difficulty in estimating the fair value of compensation is associated with discrepancies between reported and realized values. Fourth, we examine the effect of managers' discretion in estimating the value of reported pay because biasing reported compensation downward is likely to increase the difference between reported and realized compensation on average (Aboody et al. 2006; Hodder et al. 2006; Bratten et al. 2015). We expect both complexity and discretion to be positively associated with the absolute pay difference.

We find evidence that pay structure is significantly associated with the absolute pay difference as predicted. CEOs who derive a greater percentage of their compensation from share-based compensation have larger pay differences, and the effect of stock options is greater than

the effect of restricted stock. CEOs with no reported share-based compensation in the current year and those with a greater year-over-year shift from options also have higher absolute pay differences. Finally, longer-tenured CEOs and CEOs in their last year also exhibit greater absolute pay differences.

Also consistent with expectations, both accounting profitability and returns as well as proxies for estimation complexity (e.g., return volatility, growth opportunities measured using the market-to-book ratio, and firm size) are positively associated with absolute pay differences. Finally, the extent of managerial discretion in estimating option grant date fair values is positively associated with absolute pay differences, consistent with managers' responding to incentives to decrease estimates of reported pay thereby increasing the absolute pay difference, all else equal. When we examine *signed* difference between realized and reported pay, results are generally consistent with absolute amounts, with the exception of pay structure. We estimate a negative association between share-based compensation and the signed difference, which indicates that the difference between realized and reported pay is less positive or more negative when CEOs receive a larger portion of their compensation in options or stock.

In our final set of analyses, we examine the implications of these patterns for the newest pay disclosure, the CEO pay ratio. The average CEO pay ratio in our sample indicates the average CEO makes roughly 176 times what the median worker does based on *reported* pay. However, if the pay ratio were based on realized instead of reported amounts, the average CEO in our sample would earn over 200 times what the median worker does. Despite an increase in the average pay ratio when calculated using realized pay, the ratio would decrease for approximately 57 percent of the sample if calculated using realized rather than reported amounts. This finding indicates that the CEO pay ratio as currently computed and reported may be

overstated for the majority of sample firms in the sample. In contrast, 41 percent of the sample would report a higher pay ratio if it was calculated using realized instead of reported pay. We also find evidence that the signed difference between realized and reported pay is significantly lower in years that firms are required to disclose the pay ratio, although the absolute amount is not significantly different. This pattern of results is consistent with higher reported amounts relative to realized amounts after disclosure of the pay ratio became mandatory.

This study makes three contributions. First, we contribute to literature on the financial reporting of executive compensation by quantifying the difference between realized and reported CEO pay and examining its determinants for a large sample of firms.[2] Understanding the magnitude and distribution of this difference is critical to regulators implementing or proposing policies aimed at adding transparency and accountability to executive compensation. Although these policies often rely on reported amounts, we find large differences between reported and realized values, with the direction and magnitude varying predictably. Thus, requiring a one-size-fits-all approach to reporting and evaluating executive pay practice may be ineffective. For example, despite media and watchdog group reports that focus on either isolated cases or the largest firms and claim realized pay often significantly exceeds reported amounts, we find realized pay is *lower* than reported pay in most firm-years. Moreover, understanding factors driving the difference between realized and reported pay can not only help stakeholders evaluating the CEO's compensation identify when reported pay is likely to substantially deviate from realized compensation but also better understand how to interpret the difference base on how it likely arose.

[2] Core et al. (2008) also provide descriptive statistics and examine the determinants of "payout" for a sample of firms from 1993 through 2001. Although related, this variable differs from our measure of realized pay and their sample predates all of the SEC initiatives over the last 15 years aimed at increasing transparency.

Second, we contribute to the literature on managerial incentives to understate reported stock-based compensation. Whereas prior literature documents that management uses discretion to understate estimates relative to benchmark values, we compare estimates in year *t* to realizations in year *t*. Our evidence suggests that the difference between realized and reported compensation is larger when managers exercise discretion over inputs to valuation models.

Finally, we extend the literature on executive compensation. Many studies on the determinants and consequences of executive pay consider only reported amounts. Our findings reveal often substantial differences in reported and realized CEO pay. Thus, examining only reported amounts may result in incomplete, and potentially biased, inferences.

II. Regulatory Background and Prior Literature

Regulatory Background: Financial Reporting of Executive Compensation

Over the course of the last two decades, the Securities and Exchange Commission (SEC) has enacted regulations requiring modifications of public firms' executive compensation disclosures. The first of these regulations, the Executive Compensation and Related Person Disclosure (SEC 2006), requires numerous new disclosures. Specifically, firms must provide additional tabular disclosures that detail (1) the amount and forms of current year compensation, including the fair value of the options on the grant date as determined under SFAS 123R, (2) exercises and holdings of previously awarded equity, and (3) post-employment compensation benefits. Firms must also now provide a Compensation Discussion and Analysis section that discusses material information about the compensation objectives and policies for named executive officers, including details on the timing and pricing of stock option grants. Collectively, these new disclosures are "intended to provide investors with a clearer and more complete picture of the compensation earned by a company's principle executive officer,

principal financial officer and highest paid executive officers and members of its board of directors." The final regulation mentions that although the SEC considered including additional disclosures highlighting aspects related to realized versus contingent or opportunity pay, the current Summary Compensation Table is based on reported pay because of concerns that including information amount other than reported amounts would confuse investors and lead to double counting (SEC 2006).

The Shareholder Approval of Executive Compensation and Golden Parachute Compensation (SEC 2011), commonly referred to as the "Say on Pay" regulation, requires a non-binding shareholder advisory vote in proxy statements to approve the compensation of firms' named executive officers. This advisory vote must be held at least once every three years. Even though Say on Pay votes are nonbinding, proponents argue that they increase shareholder oversight of executive pay and improve communication between boards and shareholders. The most recent regulation, the Pay Ratio Disclosure (SEC 2015), requires disclosure of the median of the annual total compensation of all employees of a firm (excluding the CEO), the annual total compensation of the firm's CEO, and the ratio of the annual total compensation of the CEO to the annual total compensation of the median employee. In general, these Pay Ratio disclosures are intended to provide shareholders with a firm-specific metric that can assist in their evaluation of a firm's executive compensation practices. Moreover, the metric included in the Pay Ratio disclosure is intended to provide shareholders with new data points that may be useful when exercising their Say on Pay voting rights.

Our study focuses on the extent to which estimated fair values (i.e., reported compensation) reflect realized amounts. Quantifying and explaining the difference between these amounts is informative to regulators and other interested stakeholders regarding the adequacy of

current disclosures in assessing CEO pay. To the extent reported pay is a poor proxy for realized pay, the current disclosures may be insufficient.

Media and Watchdog Reporting of Recent Executive Compensation Practices

Driven by concerns that excessive executive compensation stifles economic growth, hurts shareholder returns, and contributes to income inequality (Baker et al. 2019), the media and watchdog groups have used these disclosures to scrutinize CEO compensation. Many articles and reports highlight the steady rise of CEO pay and the often-extreme discrepancy between executive and employee pay. For example, MyLogIQ, a data aggregator, produces a report entitled "The Thousand Times Plus CEO Pay Ratio Club in the S&P 500" (MyLogIQ 2019). This report focuses on extreme discrepancies between executive and employee pay and highlights that some executives earn the equivalent of their firm's median employee's salary in less than 40 minutes (e.g., The Gap, Mattel). The Economic Policy Institute has produced similar reports (e.g., Baker et al. 2019; Mishel and Wolfe, 2019) highlighting the dramatic 940% increase in CEO pay over the last forty years relative to the 12 percent increase for the typical worker and discussing potential ways to rein in executive compensation. The AFL-CIO maintain the "Executive Paywatch" website (http://aflcio.org/paywatch) that aggregates data on executive compensation and highlights the largest executive compensation packages and pay ratios. Media outlets also analyze executive compensation with the Wall Street Journal creating "The WSJ CEO Pay Ranking" in which journalists compare executive compensation relative to shareholder returns. The 2018 Wall Street Journal report highlights that most S&P CEOs received raises of five percent or more despite total shareholder return of -5.8 percent (Francis and Ketineni, 2019).

In general, reports focus on the estimated fair value of the CEO compensation rather than the actual compensation realized. The earliest notable exception is Hopkins and Lazonicks

(2016) report for the Institute of New Economic Thinking which argues that most reports and media articles focus on estimated pay because the SEC and FASB have, in effect, "relegated to statistical obscurity executives' readily available, accurate, and actual realized gains from stock-based pay." In this report as well as several follow-up articles, Hopkins and Lazonick provide evidence that focusing on realized pay would increase executive compensation more than ten-fold for select executives and would increase average pay ratios among the largest firms by approximately 200 to 300 percent depending on how pay ratios are computed. The media has begun to recognize this realized pay difference (also referred to as the "new pay gap") with the Wall Street Journal recently reporting on pay practices and the discrepancies between estimated and reported values (Francis, 2019).[3]

Despite increasing scrutiny of executive compensation and reports highlighting that realized compensation at times exceeds reported compensation, much remains unknown about this difference. First, reports highlighting differences almost exclusively focus on firms in the S&P 500 or some small subset of the largest public firms. Although there is no denying the importance of firms operating in the S&P 500, these firms are not representative of the population of firms to which SEC disclosure requirements apply. Because these reports are often paired with policy recommendations, it is important to understand the compensation practices of a more complete population of firms. Second, although recent reports highlight the existence of differences between realized and reported pay, no existing study to our knowledge attempts to understand the determinants of these differences. To ascertain whether pay difference should be of concern, it is important to first understand what drives them. This study tries to address both of these points by quantifying the discrepancy between estimated and realized pay for a broad

[3] Additional recent work has highlighted the difference between the realized and reported pay of CEOs in Europe (Kotnik, Sakinç, and Guduraš 2018).

sample of firms and then identifying the macroeconomic and firm-specific characteristics that explain it.

What is Reported versus Realized CEO Compensation?

Reported pay is the estimated value of compensation awarded in year *t* whereas realized pay is the amount compensation paid in year *t*. Both measures include the same amounts for the CEO's salary, bonus, non-equity incentive plan compensation, pension value changes, and other compensation. However, reported pay includes the estimated fair value of stock and option grants whereas realized pay includes the actual economic value of stock awards vested and options exercised in year *t*. These two amounts differ when the estimated fair value of stock and option grants in year *t* is not the same as the actual economic value of stock vested and options exercised in year *t*. Differences are expected because the majority of compensation granted to CEOs of large public firms each year is in the form of share-based compensation (Roe and Papadopoulus 2019).

As an illustrative example, Appendix A presents Proctor & Gamble's 2019 Summary Compensation Table. The table reports approximately $20.5 million of reported compensation for CEO David Taylor, which includes $3.3 million of option grants and $9.8 million of stock awards. However, the Option Exercises and Stock Vested table reveals that the realized value of Taylor's exercised options and vested stock totaled over $23.1 million in 2019. As such, his realized compensation (about $30.5 million) exceeded his reported compensation ($20.5 million) by $10 million, a difference of 49 percent relative to his reported pay.

What Explains the Differences in Reported and Realized CEO Compensation?

In this section, we discuss factors that we expect will influence the absolute pay difference. We identify factors that can influence the amount of reported pay, realized pay, or both.

CEO Pay Structure

CEO compensation packages often consist of a combination of salary, bonus, time-based or performance-based restricted stock, stock options, and other pay. Share-based compensation is the primary source of the difference between reported and realized amounts because reported amounts are based on grant date fair value estimates of awards in year *t* whereas realized amounts reflect stock vested and options exercised in year *t*. Because of time lags between grants and realizations beyond one year, these two amounts are rarely equal. We therefore anticipate that higher proportions of share-based pay will be positively associated with absolute pay differences. Because of the greater complexity in estimating option values relative to restricted stock, we expect a stronger positive association for options.[4]

We also consider reductions in the extent to which a CEO's pay is derived from share-based compensation, and particularly stock options. A CEO will demand greater compensation when paid in options (due to greater downside risk) relative to other forms of share-based compensation. As such, a substantial shift from options to restricted stock will decrease a CEO's current reported compensation while not affecting realized compensation, which is a function of

[4] For example, assume a company issues one option to a CEO in year *t* with a strike price of $10. The CEO exercises the option in *t*+*n* when the shares are trading at $14. The firm once again issues one option to the CEO in *t*+n. Holding all inputs to the Black Scholes calculation constant and assuming the strike price equals the grant date fair value, there will be a Pay Difference in *t*+n equal to $1.92 (*Realized Pay* equals $4.00, *Reported Pay* equals $2.08). In contrast, if instead the CEO received one time-based restricted stock award under the same fact pattern, there would be no Pay Difference in *t*+n (*Realized Pay* equals $14.00, *Reported Pay* equals $14.00). The process for estimating the value of performance-based restricted stock is more complex and likely results in a non-zero Pay Difference.

the prior year awards. A substantial shift of options to restricted stock did occur in our sample period as a result of SFAS 123R. Prior to the enactment of SFAS 123R in 2006, which required firms to expense (rather than merely disclose) the fair value of stock options granted, firms utilized stock options as the primary form of stock-based compensation because options generally resulted in no compensation under GAAP. Following SFAS 123R, firms financial reporting incentive to utilize options over restricted stock declined, and firms' use of options (restricted stock) declined (increased) (Brown and Lee 2011). As such, we expect to observe larger absolute pay difference as firms shift to restricted stock from options. We also expect to observe larger absolute pay difference for firms that report a zero value of share-based pay to their CEO during the year. Assuming the CEO vests in shares or exercises options granted in prior years, realized pay should exceed reported pay thereby leading to a larger absolute pay difference all else equal.

Performance

The primary motivation for issuing share-based compensation is to align manager and shareholder incentives such that managers strive to maximize profits and increase firm value. Performance can result in changes to the inputs to option valuation models and create cross-sectional differences in both reported and realized pay in year *t.* For example, positive performance generally increases the absolute pay difference for options valued using Black Scholes model, holding all inputs other than price constant. Moreover, sufficiently negative firm performance can reduce the value of realizations while having a smaller effect on reported amounts. As an extreme example, options that expire out of the money leave the CEO with no realized pay from options in year *t* but likely a positive value of option grants in year *t.* Overall, these patterns suggest a positive association between firm performance and the absolute pay

difference. This prediction is not without tension, however. Depending on how firms modify grants, performance could similarly affect both realized and reported share-based compensation, resulting in no statistically significant change on average.

Complexity in Estimating Reported Pay

Estimating the value of options and some restricted stock is a complex task, and even more so for firms that are themselves complex. Difficulty in estimating the value of share-based compensation can lead to differences in the reported value because two reasonable parties may differ in how they estimate the reported value as complexity increases. Holding realized compensation constant, overstated (understated) reported pay will decrease (increase) the signed pay difference relative to benchmark amounts. We therefore examine firm characteristics than can influence the complexity of estimating the value of share-based compensation. We include firm size, growth opportunities and return volatility. Firm size encompasses a variety of factors related to the complexity of operations and macroeconomic impacts on the firm. Even holding constant the pay structure and firm size, market volatility can affect both reported and realized amounts. Growth opportunities can also affect expectations about future performance. We thus expect larger absolute pay differences for CEOs of larger firms, firms with greater growth opportunities, and firms with greater historical return volatility.

Managerial Discretion in Estimating Reported Pay

We also consider the possibility that some firms exercise discretion to intentionally report lower estimated fair values of share-based pay. A substantial prior literature provides evidence that managers exercise discretion when estimating employee stock option (ESO) fair values to understate the reported values and, thus, the reported stock option expense. These studies find that managers exercise discretion when selecting the option valuation model (Bratten et al. 2015)

and valuation model inputs (Aboody et al. 2006; Hodder et al. 2006; Bartov et al. 2007; Johnston 2006; Choudhary 2011) to understate reported ESO fair values. Given this discretion affects the level of reduction in current reported compensation but has no impact on realized compensation, we anticipate absolute pay differences are positively related to discretion.

III. Sample and Research Design

Sample

Our sample is drawn from the Execucomp database. We begin the sample in 2006, when the SEC first required firms to report the estimated fair value of stock-based compensation granted; prior to this date, stock option compensation was reported based on its intrinsic value. Our sample ends in 2019 to avoid any potential effects of COVID-19 on CEO compensation that might not generalize. We require observations to have data necessary to calculate reported and realized compensation for the CEO as well as variables of interest. The sample includes 21,733 CEO-year observations. We identify the CEO using the "CEOANN" variable in Execucomp such that we report only one observation per firm-year.

Research Design

Our study has three objectives: (1) to quantify the difference between reported and realized CEO pay for a large sample of Execucomp firms, (2) to identify factors associated with that difference, and (3) to illuminate how these differences affect the CEO pay ratio. We first quantify the difference between realized and reported CEO pay in dollars. We construct the variable (*Pay Difference* $) such that it is positive (negative) when realized pay in year *t* exceeds (is less than) reported pay in year *t*. We also scale the difference by reported pay and examine both absolute (|*Pay Difference* %|) and signed (*Pay Difference* %) values. Larger values of |*Pay Difference* $\%_{i,t}$| reveal a greater disparity between these reported and realized CEO pay and

suggest that relying on reported amounts to evaluate CEO compensation could distort inferences.

To examine the factors associated with differences between reported and realized CEO pay, we estimate the following OLS regression:

$\lvert Pay\ Difference\ \%_{i,t}\rvert =$	$\alpha + \sum_k Pay\ Structure_{k,i,t} + \sum_k Performance_{k,i,t} + \sum_k Estimation\ Complexity_{k,i,t} + Estimation\ Discretion_{i,t} + \varepsilon$	(1)

We use $\lvert Pay\ Difference\ \%_{i,t}\rvert$ as the dependent variable in our primary analysis because we are interested in the factors associated with the magnitude of the difference between realized and reported pay, regardless of the sign. In supplemental analysis, we also consider signed values using *Pay Difference %* to determine whether the factors we examine are differentially associated with positive and negative differences between realized and reported CEO compensation; thus, for *Pay Difference %*, positive (negative) differences mean CEO realized compensation exceeds (is less than) reported pay.

Pay Structure

The first set of factors we examine relate to the CEO's pay structure. We use data about the components of the CEO's compensation in year *t* from Execucomp and scale each by the total reported value of the CEO's compensation in year *t* (*Reported Pay*). *Option %* is the estimated fair value of all stock options granted to the CEO in year *t* scaled by *Reported Pay*. *Stock %* is the estimated fair value of restricted stock units and award granted to the CEO in year *t* scaled by *Reported Pay*. We predict positive coefficients on *Option %* and *Stock %*. Moreover, we expect the effect of *Option %* to be greater than the effect of *Stock %* because of the inherent differences between these two types of share-based pay. Because most options are issued at the money and realized only when exercised, we expect that actual realized amounts are generally more volatile with options than restricted stock. We measure the shift from options to restricted stock over time using *Shift from Options*. This variable captures the year-over-year change in

option intensity as a percentage of share-based pay such that values are increasing in the shift away from options (i.e., a reduction in option intensity from *t*-1 to *t.*) We also include an indicator variable, *No Share-Based Pay*, equal to one if the firm reports a zero value for shared-based pay in year *t.* As constructed, we expect the coefficients on these variables to be positive. For completeness, we also include the natural log of *Reported Pay*. Because *Reported Pay* is the denominator of |*Pay Difference %*|, including this variable helps alleviate any unintended effects of scaling the dependent variable to obtain a relative amount. It also allows us to examine if |*Pay Difference %*| varies systematically with the level of CEO compensation.

Although less directly related to pay structure relative to the variables described above, we also include *CEO Tenure* and *Last Year CEO* in some specifications of equation (1). These variables account for the fact that share-based compensation often vests over multiple years such that the pay difference could be larger in later years when realized amounts attributable to exercising multiple years' worth of options or vesting in multiple years of stock could cause realized amounts to exceed reported amount. Similarly, the pay difference could be larger in the final year of a CEO's tenure at the firm when reported pay could be lower (due to a partial year of compensation) and realized pay could be higher (if the CEO cashes out of in-the-money options, has accelerated vesting of options, or both).[5]

Performance

The next two variables capture elements of a firm's performance. We consider accounting profitability and returns. We compute *Industry Adjusted ROA* as the firm's return on assets (ROA) less the average ROA for each industry-year in the sample, where industry is defined using two-digit SIC codes. We compute *Return* as the annual return in year *t*. We

[5] On the other hand, to the extent that the CEO receives severance payments in the form of cash, *Pay Difference* may be smaller in the CEO's terminal year since it is scaled by reported pay.

predict a positive coefficient on both *Industry Adjusted ROA* and *Return*. We used a signed measure to capture both accounting and stock returns because, although extreme positive and negative performance may both be associated with large deviations between reported and realized amount, positive deviations are likely more influential in the pay difference since realized values cannot fall below zero.

Estimation Complexity

We measure complexity of estimation with three variables. *Size* is the natural log of the market value of equity in year *t*. *Return Volatility* is the standard deviation of firm-level returns over the five-year period ending in the middle of the current fiscal year. Lastly, we include the market-to-book ratio, *MTB*, as the ratio of market value of equity to book value of equity in *t*-1. We expect positive coefficients on all three measures of complexity in equation (1).

Estimation Discretion

The final variable in equation (1) is *Input Discretion,* which captures managers' understatement of reported compensation from stock options granted in year *t*. *Input Discretion* equals the number of options granted in year *t* multiplied by the difference between a benchmark fair value per option granted and the firm's reported fair value per option granted. Although managers rely on estimation to record compensation related to both options and restricted stock, accounting for options may give them more discretion over the reported value. We thus follow prior studies (e.g., Aboody et al. 2006; Hodder et al. 2006) and estimate the benchmark fair value per option granted using the Black-Scholes model and the following inputs to the model: (1) exercise price as reported by the company, (2) expected option life based on the prior year option life reported by the company, (3) expected volatility calculated as the annualized standard deviation of the monthly price relatives (i.e., month-end price / beginning-of-month price) for as

many months as data are available up to the number of months of the firm's reported option life, ending in the middle of the fiscal year, (4) expected dividend yield calculated as the ratio of the prior year total dividends paid per share to the reported prior year share price, and (5) expected risk-free rate calculated as the yield of the treasury security with a maturity date closest to the end of the reported option life. These benchmark inputs are based on recent firm-specific experience (volatility and dividend yield) or recent experience in the economy (risk-free rate) and are likely choices by an objective person who exercises no discretion over the selection of model inputs. We predict a positive coefficient on *Input Discretion.*

We also include *Year Trend* in all specifications, which equals the number of years that have elapsed since the beginning of the sample.[6] This variable controls for differences in compensation across time.

IV. Results

Descriptive Statistics

In the first stage of our analysis, we quantify the difference between realized and reported CEO pay. Table 1 presents the descriptive statistics for our full sample, with all continuous variables winsorized at the 1st and 99th percentiles by year. *Reported Pay* is the amount of estimated compensation paid or awarded in year *t* whereas *Realized Pay* is the amount of the CEO's taxable compensation in year *t*. As previously discussed, both *Reported Pay* and *Realized Pay* include the CEO's salary, bonuses, non-equity incentive plan compensation, pension value changes, and other compensation. However, *Reported Pay* includes the estimated fair value of stock and option grants, whereas *Realized Pay* includes the actual economic value of stock awards vested and options exercised in year *t*.

[6] Inferences on the remaining variables are similar if we replace *Year Trend* with year fixed effects.

Table 1 reveals significant variation in *Reported Pay* with an interquartile range of over $6 million. We observe even greater variation in *Realized Pay.* On average, *Pay Difference $* is $980 thousand, which indicates the average CEOs has realized pay almost $1 million in excess of reported amounts. This magnitude equals about 16 percent of *Reported Pay*. However, the distribution of *Pay Difference $* is skewed such that the median value is negative, −$217 thousand or 4.8 percent of median *Reported Pay.* Thus, the majority of CEOs in the sample realize a lower amount of pay in year *t* than what is reported in year *t*. These descriptive statistics contradict many popular news articles and watchdog reports that suggest reported pay is grossly understated for a majority of CEOs.

In our primary analysis, we focus on |*Pay Difference %*|, the absolute difference between *Reported Pay* and *Realized Pay*, scaled by *Reported Pay*. On average, the absolute unscaled value of the difference between *Reported Pay* and *Realized Pay* is 3.62 million (untabulated), and is 57 percent of *Reported Pay.* These descriptive statistics offer the some of the first large sample evidence of the magnitude of the difference between these two measures of CEO pay and suggest that relying exclusively on one measure to either assess a firm's pay practices or to tax potentially inequitable pay could distort inferences.

Figure 1 provides more detail on the full distribution of *Pay Difference %* and |*Pay Difference %*|. Panel A shows a histogram of *Pay Difference %.* Approximately 57 percent of the sample (untabulated) discloses *Realized Pay* that is less than *Reported Pay* such that *Pay Difference* is negative. For about 3,000 observations (14 percent of the sample), this negative difference between realized and reported pay is greater than 50 percent of *Reported Pay*. In contrast, for about 3,900 observations (17.9 percent of the sample) have a positive difference between realized and reported pay that is greater than 50 percent of *Reported Pay*. Moreover, for

about 2,300 of these observations, the *Pay Difference %* exceeds one, indicating that *Realized Pay* is more than double *Reported Pay* in year *t* for these CEOs. Panel B repeats this analysis for |*Pay Difference %*|. For approximately 6,900 observations (32 percent of the sample), the absolute value of the difference between *Realized Pay* and *Reported Pay* is at least 50 percent of *Reported Pay*.

Table 1 provides full-sample descriptive statistics for variables of interest. We observe a high percentage (47 percent) of *Reported Pay* is derived from stock options and stock awards. However, approximately 10 percent of observations report no share-based compensation for the CEO. Moreover, we observe a mean shift in share-based pay from options to restricted stock of 3.6 percent per year. The average CEO tenure is 6.1 years (untabulated) and 4.9 percent of CEOs are in their last year of tenure as CEO at the firm. Sample firms are also profitable with mean *Industry Adjusted ROA* of 0.4 percent and average returns of 12 percent. Turning to estimation variables, we report average *Return Volatility* of 10.8 percent, average *MTB* of 2.96 and average market value of equity of $2.3 billion (untabulated). Managers also exercise discretion when estimating the fair value of stock options, resulting in an average reduction in the reported value of option grants of 0.14 million relative to benchmark amounts.

Time Trends

Table 2 presents information on pay difference variables and their components as well as on pay structure variables by year. Consistent with anecdotal evidence and published research, we observe an increase in *Reported Pay* and *Realized Pay* over time. *Reported Pay* increased from an average of $5.831 million in 2006 to $8.011 million in 2019, a 37 percent increase. *Realized Pay* increased similarly from $7.365 million in 2006 to $9.163 million in 2019, a 24

percent increase. These increases in *Reported Pay* and *Realized Pay* outstripped or kept up with inflation, which was approximately 24 percent over the same time period.[7]

Pay Difference $ is positive in almost every year of the sample except for during the financial crisis in 2009. Thus, *Realized Pay* exceeds *Reported Pay* on average in 13 of the 14 years in the sample period. Ignoring the financial crisis, *Pay Difference %* generally declines over the sample period, especially after 2015, from 31.8 percent in 2006 to only 13.1 percent in 2019. The trend in |*Pay Difference %*| is similar but smaller. One potential reason for the decline in *Pay Difference %* over time is the changing pay structure during the sample period. We observe a shift from options to stock awards during the sample period, with stock awards (options) increasing (decreasing) from 23.9 (18.4) percent of share-based pay in 2006 to 46.1 (7.9) percent in 2019. We present these trends graphically in Figure 2 (*Pay Difference %* and |*Pay Difference %*|) and Figure 3 (*Pay structure* variables).

Univariate evidence based on terciles of |Pay Difference %|

Table 3 presents descriptive statistics after splitting the sample into subsamples based on terciles of |*Pay Difference %*|. Observations in the bottom and middle terciles of |*Pay Difference %*| have *Reported Pay* in excess of *Realized Pay* on average whereas observations in the top tercile have *Reported Pay* less than *Realized Pay. Reported Pay, Realized Pay, Option %* and *Stock %* all increase across the terciles. Observing a monotonic increase in *Option %* and *Stock %* is consistent with the fact that the *Pay Difference* primarily arises from differences between the grant date fair values and realized values of share-based compensation. We do not observe any patterns in *Shift from Options*, *No Share-Based Pay, CEO Tenure,* or *Last Year CEO.*

[7] According to the U.S. Bureau of Labor Statistics CPI inflation calculator (https://www.bls.gov/data/inflation_calculator.htm), $1 in June 2006 was equivalent in buying power to $1.24 in June 2018.

Average values of *Industry Adjusted ROA* and *Returns* are highest in the top tercile as are average values of *MTB, Size,* and *Input Discretion.*

Regression Analysis

We present the results of estimating equation (1) in Table 4 where |*Pay Difference %*| is the dependent variable. We begin in column (1) including only pay structure variables and *Year Trend*. The positive coefficients on *Option %* and *Stock %* indicate that CEOs deriving a greater percentage of compensation from share-based compensation have larger differences between *Reported Pay* and *Realized Pay.* In terms of economic magnitude, a one standard deviation increase in *Option %* is associated with a 0.186 percentage point increase in |*Pay Difference %*|, which is 32.8 percent of the mean value of |*Pay Difference %*|. Similarly, a one standard deviation increase in *Stock %* is associated with a 0.101 percentage point increase in |*Pay Difference %*|, which is 17.8 percent of the mean. An F-test reveals the effect of *Option %* is significantly greater than that of *Stock %.* Consistent with expectations, we also estimate positive coefficients on *Shift to Options* and *No Share-Based Pay.* Before controlling for performance, the coefficient on *Ln (Reported Pay)* is significantly positive, consistent with univariate evidence from Table 3. The coefficient on *Year Trend* is also significantly positive. Although this specification does not control for performance, we obtain initial evidence consistent with our prediction of a positive association between pay structure and |*Pay Difference %*|. In column (2), we add *CEO Tenure* and *Last Year CEO* and estimate positive coefficients as expected.

In column (3), we include measures of performance. We estimate positive and significant coefficients on *Industry Adjusted ROA* and *Return.* These results indicate that more favorable (less favorable) performance is associated with larger deviations between realized and reported

pay, as we expected. We find similar results for other variables after including performance, with the exception of *Reported Pay,* which becomes insignificant.

In column (4), we include measures of estimation complexity and *Input Discretion*. We estimate positive coefficients on *Returns, Volatility, MTB,* and *Size,* as predicted. The coefficient on *Input Discretion* is also positive and significant, consistent with our expectations. This result suggests managers' reporting choices are associated with the difference between realized and reported pay. The coefficient on *Ln(Reported Pay)* is negative and significant in column (4).[8] Collectively, the results in Table 4 suggest that deviations between realized and reported compensation vary in expected ways with characteristics of the CEO's compensation package, economic determinants of realized pay, and discretion over valuation model inputs.

In Table 5, we present results from repeating the analysis in Tables 4 but using *Pay Difference %*, the signed difference between realized and reported pay, as the dependent variable. These analyses offer insights into which factors that we examine are associated with overstated or understated *Realized Pay* relative to *Reported Pay*. Regarding pay structure variables, *Option %* and *Stock %* are negatively associated with *Pay Difference %.* These coefficient estimates suggest CEOs with a larger amount of their pay derived from share-based compensation are more likely to have their *Realized Pay* less than their *Reported Pay.* All other coefficient estimates are similar to those in Table 4.

Implications for the Pay Ratio

In our final set of analyses, we explore additional implications of the material differences we observe between *Reported Pay* and *Realized Pay*. Although the SEC requires firms to

[8] This likely suggests that *Ln(Reported Pay)* proxies for *Size*. Once *Size* is included, *Ln(Reported Pay)* likely captures the mechanical effect *Reported Pay* has on the dependent variable; that is, increases in *Reported Pay* decreases the numerator of the *Pay Difference* (i.e., *Realized Pay – Reported Pay*) and increases the denominator of the *Pay Difference*.

disclose information required to compute a summary measure of *Realized Pay*, they emphasize reported amounts. Indeed, commentators argue that the SEC has "relegated to statistical obscurity executives' readily available, accurate, and actual realized gains from stock-based pay" (Hopkins and Lazonick, 2016). As such, it is not surprising that stakeholders, policymakers, and researchers tend to focus on these amounts as well. We are particularly interested in the implications of this focus for the CEO pay ratio, which a required disclosure for companies' fiscal years beginning on or after January 1, 2017 (SEC 2015). Pay ratios were aimed at providing additional transparency related to CEO compensation in the context of income inequality (Kay and Martin 2016). We are interested in how sensitive the pay ratio is to being computed using reported versus realized amounts of CEO pay.

We begin our assessment of the implication of these differences by creating two variables, *Pay Ratio_Realized* and *Pay Ratio Difference %*. We first re-compute the pay ratio using *Realized Pay* as the numerator instead of *Reported Pay.* Thus, *Pay Ratio_Realized* is realized CEO pay scaled by the median employee salary the firm discloses as an input to the pay ratio. We can compute this variable for 3,394 observations in the sample. We then compute *Pay Ratio Difference %* as the difference between the disclosed pay ratio, based on reported CEO pay (*CEO Pay Ratio*), and *Pay Ratio_Realized* scaled by *CEO Pay Ratio.*

Descriptive statistics for these variables are included in Table 6, Panel A. On average, the reported *Pay Ratio* is 175.98, which indicates the average CEO in the sample makes roughly 176 times what the median worker does based on *Reported Pay*. *Pay Ratio_Realized* is higher than the reported *Pay Ratio* on average, with a mean value of 201.21. Thus, if the pay ratio were based on realized instead of reported amounts, the average CEO in our sample would earn over 200 times what the median worker does. These trends are opposite at the median where *Pay*

Ratio is 93.00 but *Pay Ratio_Realized* is only 81.39. Thus, if the CEO pay ratio were based on realized instead of reported amounts, the median pay ratio in our sample would be lower.

Figure 4 provides the entire distribution of *Pay Ratio Difference %.* The difference is negative for 1,962 observations (approximately 58 percent of the sample), which means the pay ratio as currently computed and disclosed could be overstated for the majority of firms in the sample based on a closer approximation of relative "take-home" pay. Furthermore, firms paying taxes based on the pay ratio could be overpaying to some extent if the intent of these taxes is to mitigate income inequality, which by definition, derives from realized amounts. These firms could also be wrongly targeted by the media and watchdog groups. About three percent of the sample has no difference between the pay ratio computed using realized versus reported pay; these CEOs likely did not receive, exercise, or vest in any stock-based compensation during year *t.* The remaining 1,441 observations (39 percent of the sample) would report a higher pay ratio if based off of realized instead of reported pay. At the rightmost tail of the distribution, 354 observations (about 11 percent of the sample), would report a pay ratio more than double what they currently disclose if based off of realized rather than reported amounts. For these firms, taxes paid based on the pay ratio could therefore be "understated" and these firms could also be escaping some degree of scrutiny from media and watchdog groups.

In Panel B of Table 6, we illustrate how the pay ratio would change if it were based on realized rather than reported amounts. The diagonal shows the percentage of observations in each range of pay ratios that would remain unchanged. Across the entire sample, 39.2% of

observations would remain in the same range, 36.6% (24.2%) would shift to a lower (higher) range using realized pay.

In our last regression analysis, we examine changes in signed and absolute pay differences following the SEC's adoption of pay ratio disclosure requirements. To do so, we include one of two new variables when estimating equation (1). *Disclosure Required* is equal to one for all fiscal years during which a firm is required to disclose the pay ratio, and zero otherwise. We also consider *Disclosure Enacted*, equal to one for all fiscal years on or after the SEC finalized the new rules (October 19, 2015). This latter measure allows us to test for any anticipatory effects of disclosure on pay differences.

In Panel A of Table 7, we estimate equation (1) using *Pay Difference %* as the dependent variable. The pay ratio has received a great deal of attention from researchers, politicians, policymakers, and the public. The SEC decided to require firms to disclose only one value of the pay ratio computed using reported instead of realized pay.[9] Firms wishing to avoid scrutiny could therefore have taken steps to reduce their disclosed amount of *Reported Pay* while leaving *Realized Pay* unchanged. In this case, we could observe a positive association between *Disclosure Required* and the signed pay difference. In contrast, CEOs could postpone realizations to decrease scrutiny in the post pay-ratio era. For example, Core et al. (2008) find that media scrutiny of executive pay is increasing in stock option exercises.

In column (1), we include the full sample and estimate the coefficient on *Disclosure Required* is negative but not significant at conventional levels (two-tailed t-stat = 1.56). In column (2), we drop firm years beginning after the enactment date of the pay ratio rules (October 19, 2015) and before the compliance date (January 1, 2017) from the sample to avoid any change

[9] Although only one pay ratio is required, the SEC allows supplemental pay ratios (Lin, Chiu, and Gilbert 2018). It is anticipated that these supplemental ratios will become more prevalent in 2021 (Colucci, Vnuk, and Hovden 2021).

to *Realized Pay* or *Reported Pay* in anticipation of the pay ratio disclosure. In this sample, we estimate a significant negative coefficient on *Disclosure Required*. Thus, firms exhibit smaller positive (or more negative) differences between *Realized Pay* and *Reported Pay* in years when they are required to disclose the pay ratio. We find similar results in column (3) where we use *Disclosure Enacted* as our variable of interest.

We repeat this analysis in Panel B using |*Pay Difference %*| as the dependent variable. We estimate no significant coefficients on *Disclosure Required* of *Disclosure Enacted*. Combined with results in Panel A, this pattern suggests a shift from positive values of *Pay Difference %* to negative values after the enactment of the pay ratio disclosure requirements without any change in the overall difference between reported and realized amounts.

V. Conclusions

We quantify the difference between realized and reported CEO pay and examine what factors explain this difference. Although we find evidence that large positive differences exist, the difference between realized and reported pay is negative in most cases. We note that the absolute value of the difference exceeds 32 percent of over half of the firms in our sample. Both absolute and signed pay differences are impacted by the CEO's compensation structure (pay structure), firm performance, and complexity and discretion in estimating option values.

We also examine the implications these differences on the pay ratio. For the subsample of observations that report a pay ratio, we find an average reported pay ratio of 176 in our sample, but if the pay ratios were based on realized instead of reported amounts, this average would be over 200. However, the difference between pay ratios based on realized versus reported amounts is negative for approximately 57 percent of the sample, which means the pay ratio as currently computed and disclosed could actually be overstated for the majority of sample firms in the

sample. In contrast, 41 percent of the sample would report a higher pay ratio if based on realized instead of reported pay.

Overall, our results suggest that reported compensation is often a poor approximation of the compensation ultimately received by executives. Our results provide important evidence to regulators, politicians, and investors relying on these disclosures, as well as academics studying determinants and consequences of executive pay.

References

Aboody, D., M. E. Barth, and R. Kasznik. 2006. Do firms understate stock option-based compensation expense disclosed under SFAS 123? *Review of Accounting Studies* 11 (4): 429–61.

Bartov, E., P. Mohanram, and D. Nissim. 2007. Managerial discretion and the economic determinants of the disclosed volatility parameter for valuing ESOs. *Review of Accounting Studies* 12 (1): 155-179.

Baker, D., J. Bivens, and J. Schieder. 2019. Reining in CEO compensation and curbing the rise of inequality. Economic Policy Institute. https://www.epi.org/publication/reining-in-ceo-compensation-and-curbing-the-rise-of-inequality/

Bratten, B., R. Jennings, and C. M. Schwab. 2015. The effect of using a lattice model to estimate reported potion values. *Contemporary Accounting Research* 32 (1): 193-222.

Brown, L. D., and Lee, Y. 2011. "Changes in Option-Based Compensation around the Issuance of SFAS 123R." Journal of Business Finance & Accounting, 38 (2011), 1053–1109

CBS News. 2019: https://www.cbsnews.com/news/ceo-pay-ratio-typical-ceo-pay-package-up-7-percent-last-year-to-a-total-12-million/;

Center on Executive Compensation. 2020. California Pay Ratio Tax Bill Passes House Committee. Available at https://execcomp.org/News/NewsStories/california-pay-ratio-tax-bill-passes-house-committee.

Choudhary, P. 2011. Evidence on differences between recognition and disclosure: A comparison of inputs to estimate fair values of employee stock options. *Journal of Accounting and Economics* 51 (1-2): 77-94.choud

Colucci, R., M. Vnuk, and J. Hovden. 2021. 2021 CEO Pay Ratio Disclosure—New Considerations and Expectations. Working Paper, Compensation Advisory Partners. Available at https://s3.us-east-2.amazonaws.com/capartners.production/wp-content/uploads/2021/01/15073831/CAPintel-21-01-19-2021-CEO-Pay-Ratio-Disclosure-%E2%80%93-New-Considerations-and-Expectations.pdf

Core, J. E., R. W. Holthausen, and D. F. Larcker. 1999. Corporate governance, chief executive officer compensation, and firm performance. *Journal of Financial Economics* 51 (3): 371-406.

Core, J. E., W. Guay, and D. F. Larcker. 2008. The power of the pen and executive compensation. *Journal of Financial Economics* 88 (1): 1-25.

Francis, T. and L. Ketineni. 2019. The WSJ CEO Pay Ranking. An Analysis of 2018 Compensation from S&P 500 Leaders. The Wall Street Journal. May 16, 2019.

Francis, T. 2019. The New Pay Gap: What Firms Report Paying CEOs Versus What They Take Home; Intricate Pay structures can multiple the number of shares ultimately awarded; Oracle chief's pay rises 41% to $267 million. The Wall Street Journal. August 25, 2019.

Hartzell, J. C. and L. T. Starks. 2003. Institutional investors and executive compensation. *The Journal of Finance* 58 (6): 2351-2374.

Hodder, L., W. J. Mayew, M. L. McAnally, and C. D. Weaver. 2006. Employee stock option fair value estimates: Do managerial discretion and incentives explain accuracy? *Contemporary Accounting Research* 23 (4): 933–75.

Hopkins, M., and Lazonick, W. 2016. The mismeasurement of mammon: uses and abuses of executive pay. Working Paper, Institute of New Economic Thinking. Available at https://www.ineteconomics.org/research/research-papers/the-mismeasure-of-mammon-uses-and-abuses-of-executive-pay-data

Johnston, D. 2006. Managing stock option expense: The manipulation of option-pricing model assumptions. *Contemporary Accounting Research* 23 (2): 395-425.

Kay, I., and B. Martin. 2016. The SEC's mandated CEO pay ratio in the context of income inequality: Perspectives for compensation committees. Pay Governance, LLC whitepaper. Available at https://corpgov.law.harvard.edu/2016/10/25/ceo-pay-ratio-and-income-inequality-perspectives-for-compensation-committees/.

Kotnik, P., M. E. Sakinç, and D. Guduraš. 2018. Executive compensation in Europe: Realized gains from stock-based pay. The Institute for New Economic Thinking. June 13, 2018.

Lazonick, W. and M. Hopkins. If the SEC Measured CEO Pay Packages Property, They Would Look Even More Outrageous. Harvard Business Review. December 22, 2016.

Lin, Kyoko Takahashi, N. Chiu, and A. L. Gilbert. 2018. The first wave of pay ratio disclosures. *Harvard Law School Forum on Corporate Governance*. Available at https://corpgov.law.harvard.edu/2018/03/27/the-first-wave-of-pay-ratio-disclosures/.

Mishel, L. and Julia Wolfe. CEO compensation has grown 940% since 1978. Economic Policy Institute. August 14, 2019.

MyLogIQ. The Thousand Times Plus CEO Pay Ratio Club in the S&P 500. April 11, 2019. https://files.mylogiq.com/Link_Files/ReportFiles/The%20Thousand%20Plus%20Club%204.12.19.pdf

Roe, J. and K. Papadopoulus 2019. 2019 U.S. Executive Compensation Trends. Available at https://corpgov.law.harvard.edu/2019/04/16/2019-u-s-executive-compensation-trends/

Securities and Exchange Commission (SEC). 2006. Executive Compensation and Related Person Disclosure. Final rule. Available at https://www.sec.gov/rules/final/2006/33-8732a.pdf

Securities and Exchange Commission (SEC). 2011. Shareholder Approval of Executive Compensation and Golden Parachute Compensation. Available at https://www.sec.gov/rules/final/2011/33-9178.pdf

Securities and Exchange Commission (SEC). 2015. Pay Ratio Disclosure. Available at https://www.sec.gov/rules/final/2015/33-9877.pdf

Stebbins, S. 2019. These CEOs make 1,000 times more than their employees. 24/7 Wall Street. https://www.usatoday.com/story/money/2019/04/17/these-ceos-make-1000-times-more-than-their-employees/39350499/

Appendix A

Example of Reported vs. Realized Pay

The following are from the 2019 Proxy Report filed by Proctor & Gamble.

Summary Compensation

The following table and footnotes provide information regarding the compensation of the NEOs, for the fiscal years shown.

Name and Principal Position	Year	Salary ($)	Bonus[1] ($)	Stock Awards[2] ($)	Option Awards[3] ($)	Non-Equity Incentive Plan Compen-sation ($)	Change in Pension Value and Non-qualified Deferred Compen-sation Earnings[4] ($)	All Other Compen-sation[5] ($)	Total ($)
David Taylor									
Chairman of the									
	2018–19	1,650,000	5,409,400	9,768,118	3,251,263	0	0	420,031	20,498,812
Board, President									
	2017–18	1,600,000	2,736,000	9,642,358	3,125,011	0	0	250,887	17,354,256
and Chief Executive	2016–17	1,600,000	4,080,384	9,226,929	3,000,001	0	0	188,863	18,096,177
Officer									

Option Exercises and Stock Vested

The following table and footnotes provide information regarding stock option exercises and stock vesting during FY 2018-19 for the NEOs.

OPTION EXERCISES AND STOCK VESTED

	Option Awards			Stock Awards		
Name/Plan	Option Grant Date	Number of Shares Acquired on Exercise[1] (#)	Value Realized on Exercise[2] ($)	Stock Award Grant Date	Number of Shares Acquired on Vesting[3] (#)	Value Realized on Vesting[4] ($)
David Taylor[5]						
Key Manager	02/26/2010	33,113	931,121			
Key Manager	02/28/2011	98,335	2,918,906			
STAR	09/15/2011	16,338	520,215			
Key Manager	02/29/2012	103,673	3,733,528			
STAR	09/14/2012	43,045	1,647,355			
PSP 2016-2019				02/28/2017	87,089	9,549,309
PST Restoration				08/02/2018	3,457	269,255
LTIP				02/28/2019	31,920	3,500,082

Appendix B
Variable Definitions

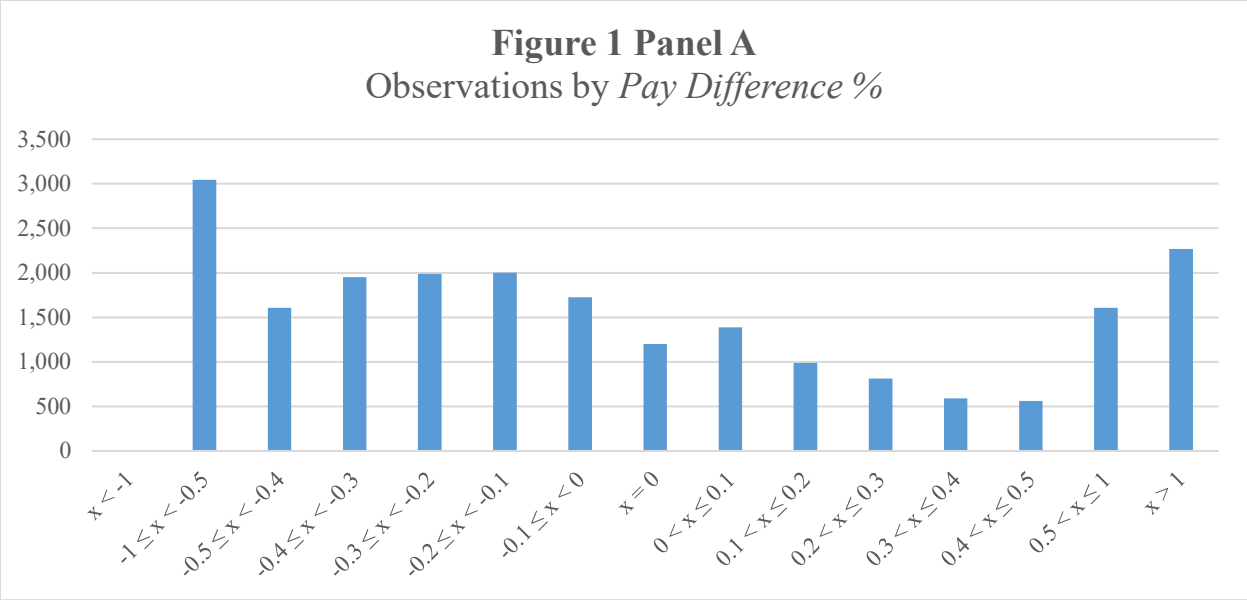
Variable	Definition & Source	Source
Pay Ratio	The ratio of CEO to median worker pay as reported by the firm for year *t*.	*CalcBench*
Pay Ratio_Realized	The ratio of CEO to median worker pay recomputed using realized values of CEO compensation in year *t*.	*CalcBench* and *Execucomp*
Pay Ratio Difference (%)	The percentage change from *Pay Ratio* to *Pay Ratio_Realized* in year *t*.	*CalcBench* and *Execucomp*
CEO Tenure	The natural log of the number of years as CEO of the firm as of year *t*.	*Execucomp*
Disclosure Required	Indicator = 1 for firm years beginning on or after January 1, 2017, when firms were required to disclosure the pay ratio, and 0 otherwise.	*Compustat*
Disclosure Enacted	Indicator = 1 for firm years beginning on or after November 1, 2015, after the enactment date of SEC rules requiring pay ratio disclosure, and 0 otherwise.	*Compustat*
Industry Adjusted ROA	Mean industry-adjusted (2 digit SIC) annual return on assets in year *t*.	*Compustat*

Appendix B, continued

Variable	Definition & Source	Source
Input Discretion	The number of options granted in year *t* multiplied by the difference between the estimated benchmark fair value per option granted and the firm's reported fair value per option, where the benchmark fair value is calculated using the following Black-Scholes model inputs: (1) exercise price as reported, (2) option life based on the prior year option life reported, (3) volatility calculated as the annualized standard deviation of the monthly price relatives over a period equal to the reported option life, ending in the middle of the fiscal year, (4) dividend yield as the ratio of the prior year total dividends paid per share to the reported prior year share price, and (5) risk-free rate as the yield of the treasury security with a maturity date closest to the end of the reported option life.	*Compustat* and *CRSP*
Last Year CEO	Indicator = 1 if the CEO's last day in office occurs during year *t*.	*Execucomp*
Ln (Reported Pay)	The natural log of *Reported Pay* in year *t*.	*Execucomp*
MTB	The market value of equity divided by the book value of equity in year *t-1*.	*Compustat*
No Share-Based Pay	Indicator = 1 if the CEO receives no reported stock or option awards in year *t*.	*Execucomp*
Option %	The percentage of *Reported Pay* from options awarded in year *t*.	*Execucomp*
Pay Difference	The sum of the realized value of shares vested and options exercised (in millions) in year *t* less the sum of the reported value of stock awards and option awards in year *t.* Note that reported and realized salary, bonus, and other compensation are equal.	*Execucomp*
Pay Difference %	*Pay Difference* divided by *Reported Pay*.	*Execucomp*

Appendix B, continued

Variable	Definition & Source	Source
|*Pay Difference %*|	The absolute value of *Pay Difference %*.	*Execucomp*
Realized Pay	*Reported Pay* recomputed using realized values of shares vested and options exercised in year *t*.	*Execucomp*
Reported Pay	The total reported CEO pay (in millions) in year *t*.	*Execucomp*
Returns	Annual firm return in year *t*.	*CRSP*
Return Volatility	The standard deviation of monthly returns over the 60 months ending 6 months prior to the end of year *t*.	*CRSP*
Size	The natural log of the market value of equity	*Compustat*
Shift from Options	The change in option awards as a percentage of total reported share-based compensation from year *t-1* to year *t*, multiplied by -1.	*Execucomp*
Stock %	The percentage of *Reported Pay* from stock awarded in year *t*.	*Execucomp*



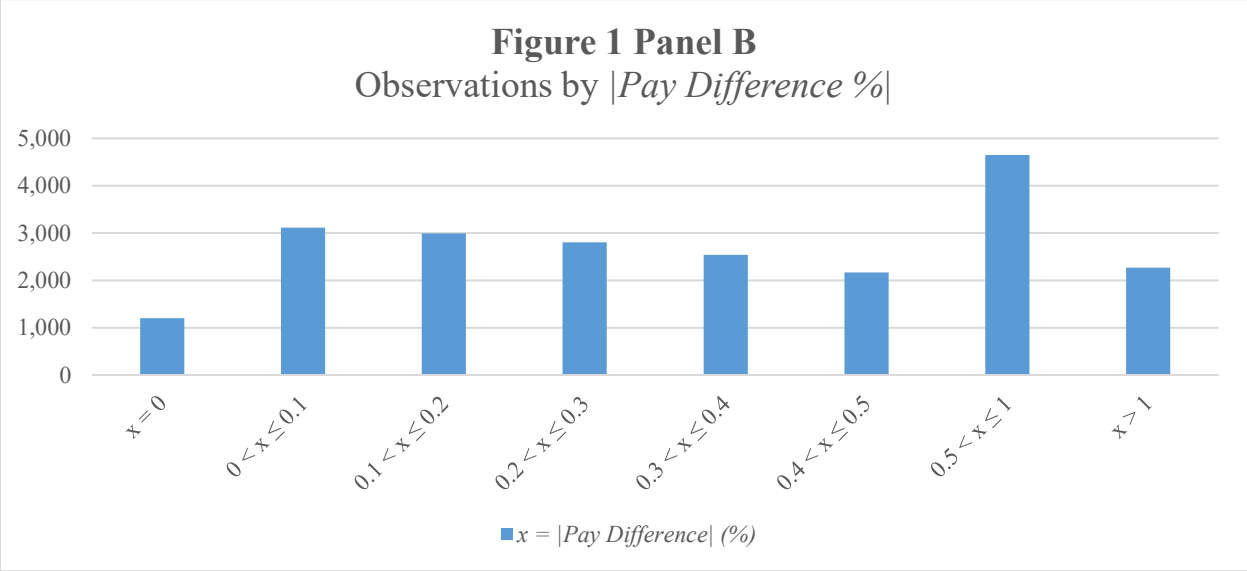


Figure 1, Panel A is a histogram of *Pay Difference %*, which we define as the signed difference between *Realized Pay* and *Reported Pay*, scaled by *Reported Pay*. Figure 1, Panel B is a histogram of |*Pay Difference %*|, which is the absolute value (unsigned) difference between *Realized Pay* and *Reported Pay*, scaled by *Reported Pay*. The sample is 27,181 CEO year observations for which we can compute *Realized Pay* and *Reported Pay.*

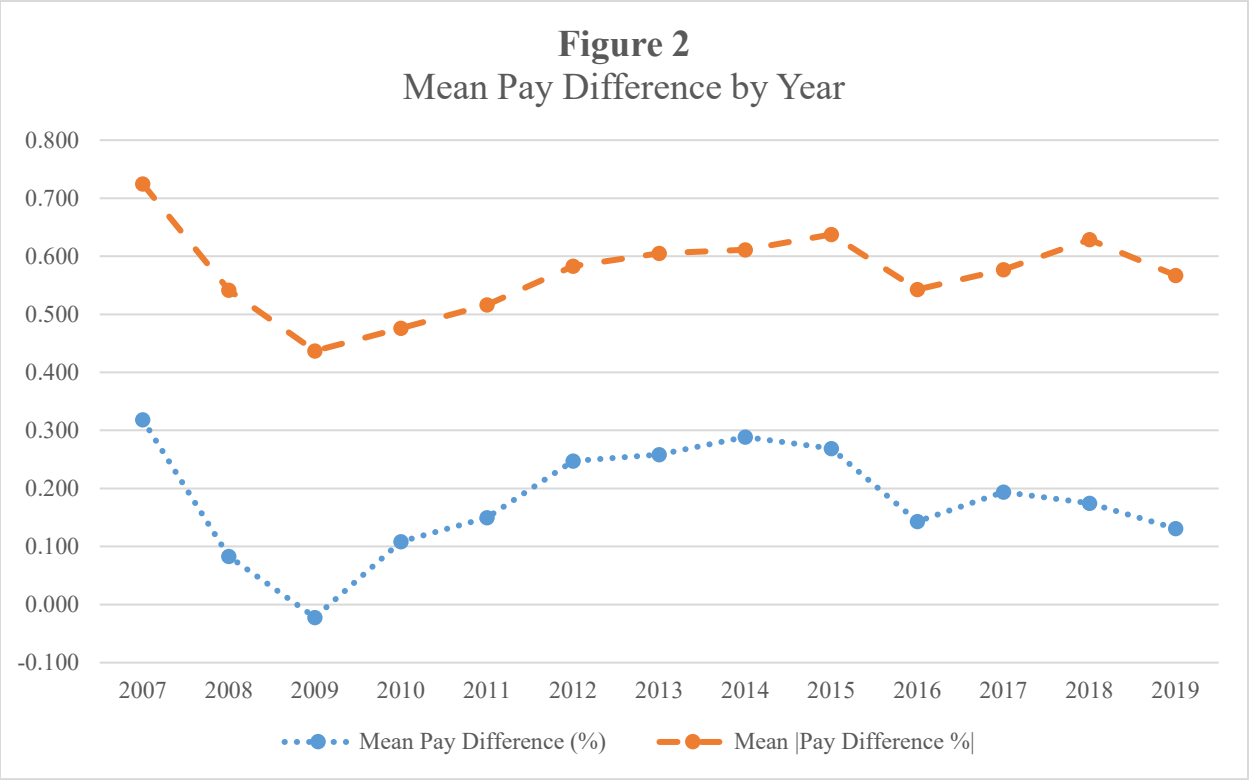


Figure 2 illustrates average values of pay differences by year. *Pay Difference %* is the signed difference between *Realized Pay* and *Reported Pay*, scaled by *Reported Pay*. |*Pay Difference %*| is the absolute value (unsigned) difference between *Realized Pay* and *Reported Pay*, scaled by *Reported Pay*.

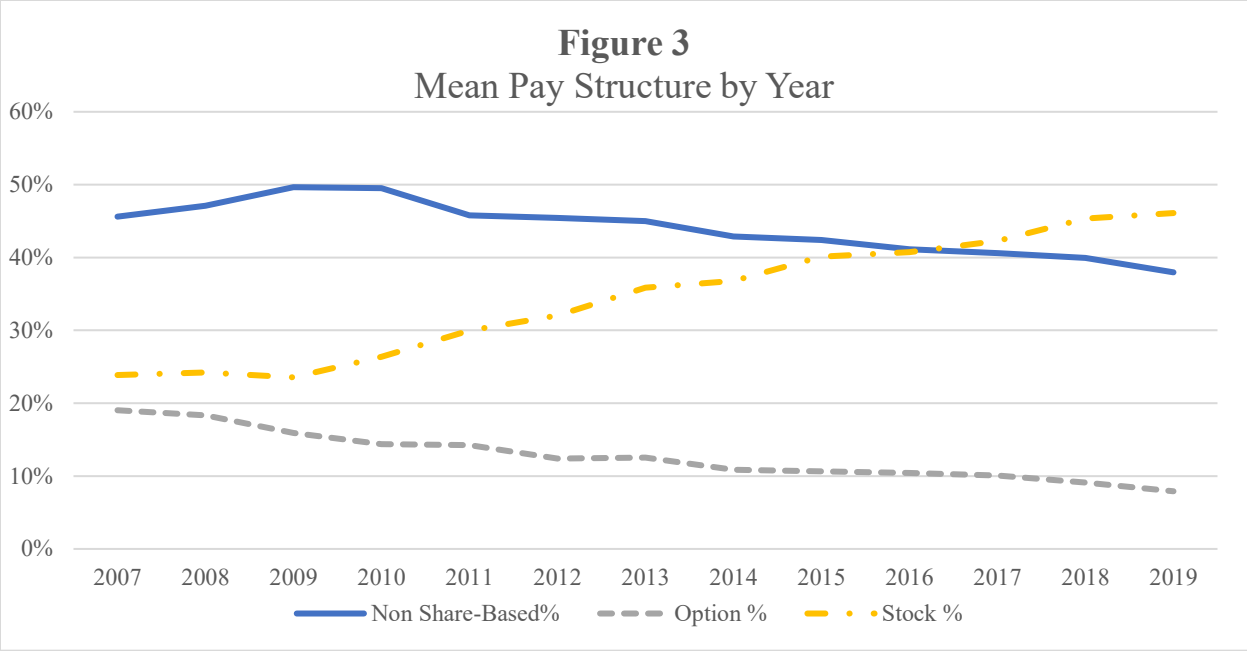


Figure 3 presents mean values of pay structure variables by year. *Non Share-Based %* is an indicator value equal to one if the firm reported no share-based pay granted to the CEO in year *t*. *Option %* is the estimated fair value of all stock options granted to the CEO in year *t* as a percentage of total compensation reported in year *t*. *Stock %* is the estimated fair value of restricted stock units and award granted to the CEO in year *t* as a percentage of total compensation reported in year *t*.

Figure 4
Observations by *CEO Pay Ratio Difference %*

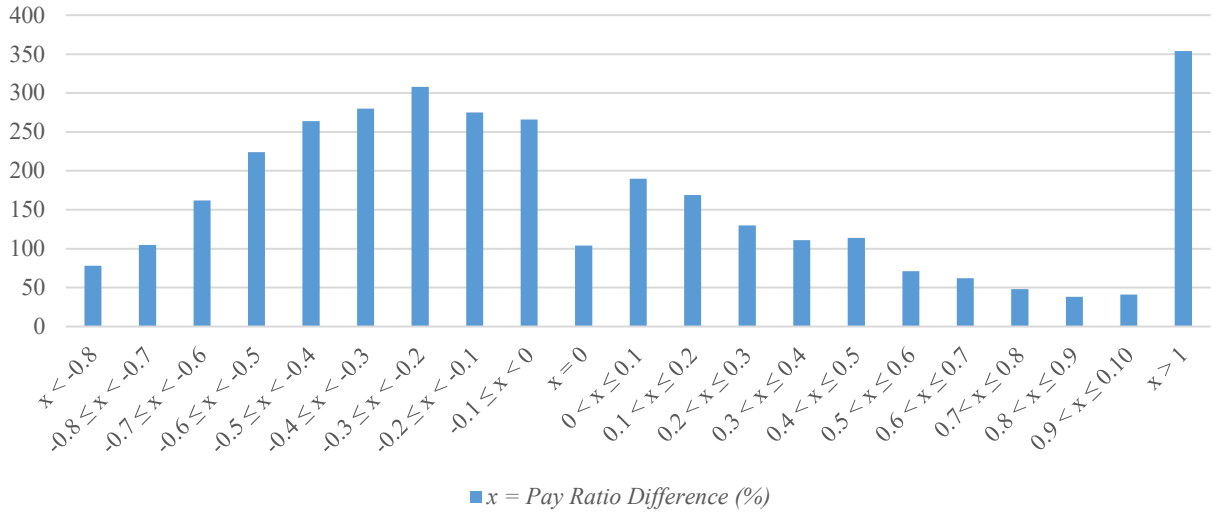


Figure 4 is a histogram illustrating the distribution of the disclosed pay ratio and a recomputed pay ratio based on *Realized Pay*. The sample is 3,394 CEO year observations for which we can observe the CEO pay ratio and median employee pay.

Table 1
Descriptive Statistics

Variable	N	Mean	S.D.	Q1	Median	Q3
Reported Pay	21,733	6.318	5.908	2.206	4.502	8.407
Realized Pay	21,733	7.347	10.210	1.724	3.755	8.294
Pay Difference $	21,733	0.980	7.353	-1.571	-0.217	1.001
Pay Difference %	21,733	0.177	1.087	-0.358	-0.086	0.246
|Pay Difference %|	21,733	0.569	0.945	0.135	0.328	0.587
Option %	21,733	0.127	0.178	0.000	0.000	0.220
Stock %	21,733	0.343	0.246	0.144	0.343	0.525
Ln (Reported Pay)	21,733	8.330	0.985	7.699	8.412	9.037
Shift from Options	21,733	0.036	0.266	0.000	0.000	0.014
No Share-Based Pay	21,733	0.102	0.303	0	0	0
CEO Tenure	21,733	1.809	0.864	1.099	1.792	2.485
Last Year CEO	21,733	0.049	0.217	0	0	0
Industry Adjusted ROA	21,733	0.004	0.093	-0.026	0.002	0.043
Returns	21,733	0.120	0.424	-0.136	0.091	0.320
Return Volatility	21,733	0.108	0.052	0.070	0.097	0.131
MTB	21,733	2.960	4.337	1.307	2.069	3.497
Size	21,733	7.745	1.674	6.624	7.653	8.826
Input Discretion	21,733	0.137	0.571	0	0	0

Table 1 presents descriptive statistics for pay difference variables and other variables of interest. All continuous variables are winsorized at one and 99 percent. See Appendix B for variable definitions.

Table 2
Pay Difference and Pay structure Through Time

Variable	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
N	1,266	1,803	1,786	1,758	1,746	1,717	1,729	1,736	1,719	1,672	1,635	1,604	1,562
Reported Pay	5.831	4.884	4.761	5.558	5.925	5.987	6.081	6.776	6.611	6.869	7.453	7.725	8.011
Realized Pay	7.365	4.998	4.316	5.953	6.452	7.633	7.462	8.557	8.538	8.008	8.988	8.708	9.163
Pay Difference $	1.421	0.114	-0.438	0.352	0.476	1.575	1.352	1.763	1.893	1.043	1.459	0.929	1.051
Pay Difference %	0.318	0.083	-0.022	0.108	0.150	0.247	0.258	0.289	0.269	0.143	0.194	0.175	0.131
|Pay Difference %|	0.725	0.542	0.437	0.476	0.516	0.583	0.605	0.611	0.638	0.543	0.577	0.629	0.567
Option %	0.190	0.184	0.159	0.144	0.142	0.124	0.126	0.109	0.106	0.104	0.101	0.091	0.079
Stock %	0.239	0.242	0.236	0.264	0.300	0.320	0.359	0.368	0.401	0.407	0.423	0.453	0.461
Shift from Options	0.101	0.039	0.038	0.059	0.028	0.043	0.021	0.037	0.022	0.017	0.019	0.029	0.026
No Share-Based Pay	0.118	0.135	0.146	0.138	0.112	0.115	0.097	0.092	0.081	0.070	0.075	0.067	0.075

Table 2 shows average values of pay difference and pay structure variables for each year in the sample period. All continuous variables are winsorized at one and 99 percent. See Appendix B for variable definitions.

Table 3
Pay structure and Economic Determinants by Tercile of |*Pay Difference %*|

	|***Pay Difference %*|:**	
Variable	Low	Middle	High
Reported Pay	5.348	6.307	7.298
Realized Pay	5.306	5.535	11.201
Pay Difference $	-0.112	-0.836	3.888
Pay Difference %	-0.024	-0.161	0.715
|Pay Difference %|	0.081	0.333	1.292
Option %	0.071	0.130	0.181
Stock %	0.282	0.366	0.382
Ln (Reported Pay)	8.082	8.386	8.523
Shift from Options	0.044	0.025	0.038
No Share-Based Pay	0.190	0.028	0.088
CEO Tenure	1.921	1.715	1.792
Last Year CEO	0.052	0.044	0.052
Industry Adjusted ROA	0.004	-0.002	0.010
Returns	0.123	0.108	0.128
Return Volatility	0.108	0.109	0.107
MTB	2.656	2.610	3.613
Size	7.535	7.674	8.027
Input Discretion	0.084	0.111	0.214

Table 3 splits the sample of 21,733 observations into terciles based on |*Pay Difference %*|, which is the unsigned difference between *Realized Pay* and *Reported Pay*, scaled by *Reported Pay*. All continuous variables are winsorized at one and 99 percent. See Appendix B for variable definitions.

Table 4
Determinants of |*Pay Difference %*|

DV = |*Pay Difference %*|	pred.	(1)	(2)	(3)	(4)
Option %	+	1.0475***	1.0990***	1.1401***	0.9777***
		(17.03)	(17.73)	(18.83)	(16.59)
Stock %	+	0.4108***	0.4673***	0.5337***	0.5062***
		(8.83)	(10.01)	(11.41)	(10.85)
Ln (Reported Pay)	?	0.0251**	0.0200*	-0.0036	-0.1308***
		(2.15)	(1.71)	(-0.30)	(-5.88)
Shift from Options	+	0.1908***	0.1951***	0.1950***	0.1824***
		(5.31)	(5.44)	(5.47)	(5.19)
No Share-Based Pay	+	0.6414***	0.6321***	0.6329***	0.5013***
		(11.10)	(10.87)	(11.06)	(9.35)
CEO Tenure	+		0.0972***	0.0895***	0.0944***
			(9.31)	(8.84)	(9.04)
Last Year CEO	+		0.1237***	0.1789***	0.1828***
			(3.31)	(4.81)	(4.97)
Industry Adjusted ROA	+			1.0384***	0.5797***
				(9.47)	(5.42)
Returns	+			0.1032***	0.0674***
				(6.66)	(3.95)
Return Volatility	+				0.5534***
					(3.02)
MTB	+				0.0176***
					(6.47)
Size	+				0.1010***
					(7.57)
Input Discretion	+				0.0619***
					(3.53)
Year Trend	?	0.0085***	0.0077***	0.0077***	0.0039*
		(3.65)	(3.33)	(3.37)	(1.76)
Option % > Stock % (*p-value*)		0.0000	0.0000	0.0000	0.0000
Adj. R^2		0.038	0.047	0.060	0.083

Table 4 presents results of estimating equation (1). The sample is 21,733 CEO-year observations. All continuous variables are winsorized at one and 99 percent. See Appendix B for variable definitions. t-statistics are in parentheses. ***, **, * indicate significance at 1%, 5%, and 10%, respectively, using two-tailed t-tests.

Table 5
Determinants of *Pay Difference*

DV = *Pay Difference %*	pred.	(1)	(2)	(3)	(4)
Option %	?	-0.3639***	-0.2535***	-0.1918**	-0.4191***
		(-4.56)	(-3.21)	(-2.53)	(-5.85)
Stock %	?	-0.5992***	-0.4785***	-0.3782***	-0.4009***
		(-10.38)	(-8.52)	(-6.83)	(-7.40)
Ln (Reported Pay)	?	0.0941***	0.0832***	0.0469***	-0.1667***
		(6.99)	(6.27)	(3.57)	(-6.48)
Shift from Options	+	0.1072***	0.1188***	0.1184***	0.1011***
		(2.76)	(3.08)	(3.11)	(2.73)
No Share-Based Pay	+	0.6080***	0.5891***	0.5893***	0.3873***
		(10.27)	(9.74)	(9.97)	(7.03)
CEO Tenure	+		0.2231***	0.2111***	0.2190***
			(18.11)	(17.85)	(17.88)
Last Year CEO	+		0.1589***	0.2432***	0.2530***
			(3.97)	(6.12)	(6.48)
Industry Adjusted ROA	+			1.6239***	0.8705***
				(13.03)	(7.15)
Returns	+			0.1481***	0.0989***
				(8.39)	(5.15)
Return Volatility	+				0.4108**
					(1.99)
MTB	+				0.0221***
					(6.91)
Size	+				0.1638***
					(10.40)
Input Discretion	+				0.1096***
					(5.61)
Year Trend	?	0.0142***	0.0126***	0.0127***	0.0059**
		(5.23)	(4.76)	(4.92)	(2.38)
Option % > Stock % (*p-value*)		0.0027	0.0028	0.0085	0.7835
Adj. R^2		0.056	0.088	0.112	0.153

Table 5 presents results of estimating equation (1), after replacing the dependent variable with the signed *Pay Difference %*. The sample is 21,733 CEO-year observations. All continuous variables are winsorized at one and 99 percent. See Appendix B for variable definitions. . t-statistics are in parentheses. ***, **, * indicate significance at 1%, 5%, and 10%, respectively, using two-tailed t-tests.

Table 6
Pay Ratio Subsample

Panel A: Descriptive Statistics

Variable	N	Mean	S.D.	Q1	Median	Q3
Pay Ratio	3,394	175.975	251.437	51.000	93.000	187.000
Pay Ratio_ Realized	3,394	201.214	358.572	37.988	81.388	190.898
Pay Ratio Difference %	3,394	0.171	1.099	-0.393	-0.100	0.291

Panel B: Correspondence between reported pay ratios and realized pay ratios

		Realized Pay Ratio								
		≤ 25	(25, 50]	(50,75]	(75,100]	(100,150]	(150,200]	(200,500]	(500,1000]	> 1000
Reported Pay Ratio	≤ 25	79.21%	14.19%	2.64%	0.99%	0.66%	0.33%	0.99%	0.33%	0.66%
	(25, 50]	23.84%	54.75%	9.12%	5.59%	3.17%	1.49%	1.86%	0.00%	0.19%
	(50,75]	9.29%	37.36%	29.00%	12.83%	6.51%	1.67%	2.97%	0.19%	0.19%
	(75,100]	5.52%	17.93%	25.06%	21.84%	18.16%	5.98%	5.06%	0.46%	0.00%
	(100,150]	2.87%	9.02%	17.62%	12.50%	29.92%	12.30%	12.09%	2.87%	0.82%
	(150,200]	2.56%	4.17%	6.41%	10.90%	23.08%	16.99%	28.21%	5.45%	2.24%
	(200,500]	0.73%	2.38%	2.56%	4.94%	10.05%	14.81%	44.97%	14.26%	5.30%
	(500,1000]	0.00%	0.70%	0.70%	1.41%	4.93%	4.93%	34.51%	34.51%	18.31%
	> 1000	0.00%	0.00%	1.09%	0.00%	0.00%	0.00%	13.04%	29.35%	56.52%

Table 6 uses a subsample from 2017 to 2019, 3,394 CEO year observations for which we can observe the pay ratio and median employee pay. Panel A provides descriptive statistics. In Panel B, we illustrate how reported pay ratios (down the rows) would correspond to alternative pay ratios if CEO pay was computed based on realized rather than reported pay (across the columns). Variables are winsorized at one and 99 percent. See Appendix B for variable definitions.

Table 7
Association with Pay Ratio Disclosure

Panel A: Signed Pay Difference

DV = *Pay Difference %*	(1)	(2)	(3)
Disclosure Required	-0.0441	-0.0873***	
	(-1.56)	(-2.58)	
Disclosure Enacted			-0.0934***
			(-3.28)
Controls	Included	Included	Included
N	21,733	20,031	21,733
Adj. R^2	0.153	0.153	0.153

Panel B: Unsigned Pay Difference

DV = *|Pay Difference| (%)*	(1)	(2)	(3)
Disclosure Required	0.0202	0.0027	
	(0.79)	(0.09)	
Disclosure Enacted			-0.0148
			(-0.58)
Controls	Included	Included	Included
N	21,733	20,031	21,733
Adj. R^2	0.083	0.082	0.083

Table 7 presents results of estimating equation (1) after including *Disclosure Required* or *Disclosure Enacted. Disclosure* is an indicator variable equal to one in all fiscal years a firm is required to disclose the pay ratio (i.e., fiscal years beginning on or after January 1, 2017). *Disclosure Enacted* is an indicator variable equal to one in all fiscal years beginning after the pay ratio legislation was enacted (i.e., on or after October 19, 2015). Column (1) and (3) include all observations, while column (2) omits observations for firm years fiscal years beginning after the enactment date of the pay ratio rules (October 19, 2015) and before the compliance date (January 1, 2017). All continuous variables are winsorized at one and 99 percent. See Appendix B for variable definitions. ***, **, * indicate significance at 1%, 5%, and 10%, respectively, using two-tailed t-tests.