

Hierarchical Pay Incentives and Firm Performance:

How do firms structure pay inside and outside C-suites to incentivize performance?

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Abstract

We investigate links between firm performance and hierarchical compensation, including CEO pay relative to not only executive but also non-executive employees. Firms often incentivize employees through large pay differentials, sometimes referred to as tournament incentives, which we link to the ratio of CEO and median employee pay. We account for pay levels and show hierarchical pay spans entire firms. Next, by studying CEO residual compensation and accounting for gaps between CEO and non-CEO executive compensation, we find high CEO pay ratios are connected to hierarchical incentives more than to overpaid CEOs. Finally, firms with both well paid employees and large pay differentials exhibit better performance, suggesting hierarchical and tournament incentives within and beyond the C-suite can effectively motivate employees. Hierarchical pay and resulting corporate cultures also have valuable operational efficiency, informing controversies in the financial press.

JEL Classification: G3; J3; M12; K22; M52

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I. Introduction

Executive compensation is among the most controversial topics within the financial press, leading to attention from policy makers and academics alike. As a result, regulators have instituted a novel disclosure of the ratio of pay between CEOs and other employees, which could inform the structure of pay throughout the firm. Still, use of the ratio and comparisons across firms often ignore the complexity of compensation within the middle of firms. However, academics recognize the importance of pay comparisons in firms. For example, researchers have examined differentials at the top of firms (e.g., tournament incentives), noting potential benefits. As a result, we combine these literatures to investigate whether the structure of compensation beyond the C-suite adds value, where research has been constrained by data limitations.

Though mandated data on pay within the middle of a firm provides information, the new ratio prompts questions about how average employee compensation should be set and may oversimplify the controversy of rising CEO pay relative to the median employee (e.g., Boone, Starkweather, and White, 2021; Murphy, 1999; Kaplan, 2008; Bertrand, 2009; Frydman and Saks, 2010; Edmans et al., 2012; Quigley and Hambrick, 2015; Murphy and Jensen, 2018).¹ While some may argue this ratio could serve as a disincentive for the average employee, theory suggests income levels may impact the importance and perception of inequality, suggesting higher average pay may also impact incentives (Nishi, Shirado, Rand, and Christakis, 2015). Moreover, employees may be incentivized to seek promotion from rank-order pay structures, in addition to finding motivation from downward comparisons, emphasizing the importance of hierarchical pay within firms (Chi,

¹ See e.g., Economic Policy Institute's "CEO compensation surged 14% in 2019 to \$21.3 million: CEOs now earn 320 times as much as the typical worker," in August of 2020 by Lawrence Mishel and Jori Kandra: <https://www.epi.org/publication/ceo-compensation-surged-14-in-2019-to-21-3-million-ceos-now-earn-320-times-as-much-as-a-typical-worker>. Also, see e.g., Equilar's "Dissecting the CEO Pay Ratio by Sector," in January of 2020 by Jonathon LaCross: <https://www.equilar.com/blogs/438-ceo-pay-ratio-by-sector.html>.

Liao, Wang, Zhao and Ye, 2018).² Therefore, we explore the role and implications of hierarchical pay structure in linking tournament incentives of CEOs with compensation throughout the firm and the resulting value and performance thereof.³

Effectively motivating management and setting compensation to align incentives with shareholders is central to a core tenet of corporate finance: maximizing firm value (Fama and Jensen, 1983). As a result, researchers study the role of the distribution of compensation within the C-suite, in addition to CEO pay size and structure, in motivating executives, by investigating the corporate benefits of tournament incentives, i.e., large pay differentials between CEOs and other executives (Kini and Williams 2012; Burns, Minnick, and Starks 2017; Lee, Lev, and Yeo, 2008). Some researchers show such pay dispersion can benefit firms by incentivizing competition among executives, improving corporate performance (Knoeber and Thurman, 1994; Green and Stokey, 1983; Kale, Reis, and Venkateswaran, 2009). However, the performance implications of hierarchical structure within non-executive employees remain unknown, particularly when median employees are more highly paid (Lazear and Rosen, 1981; Malcomson, 1984).

Still, finance research on the role of hierarchical pay structures and tournament incentives within firms has been limited, beyond top executives competing for the CEO position. Prior research documents that employee motivations are connected to the compensation structure of

² See e.g., Rosenbaum (1979), Lazear and Rosen (1981), and Rosen (1986). Connelly, Tihanyi, Crook, and Gangloff (2014) summarizes as follows: “firms induce effort from employees by effectively pooling some portion of wages from all the employees at one rank into the wages at the next highest rank, giving each the opportunity to win promotion to that rank.”

³ In addition to Lazear and Rosen (1981), Tim Harford’s Forbes May 20, 2006, article titled, “Why Your Boss is Overpaid,” investigates the incentives arising from the pay difference between CEO and other non-CEO executives to improve firm performance: https://www.forbes.com/2006/05/20/executive-compensation-tournament_cx_th_06work_0523pay.html?sh=609e01ce6f72. Harford notes that both the gap between summit and top echelons and the gap between the earnings of summit and average wage of workers produce strong incentives to everyone in the firm: “The ugly truth is that your boss is probably overpaid--and it's for your benefit, not his. Why? It might be because he isn't being paid for the work he does but, rather, to inspire you. In other words, we work our socks off in underpaying jobs in the hope that one day we'll win the rat race and become overpaid fat cats ourselves. Economists call this ‘tournament theory.’”

those around them and tournament incentives are linked to performance and risk-taking among a variety of different workers across industries, from sports organizations to mutual funds (Ehrenberg and Bognanno, 1990; Brown, 2011; Becker and Huselid, 1992; Fee, Hadlock, and Pierce, 2006; Brown, Harlow, and Starks, 1996; Chen, Hughson, and Stoughton, 2011), as well as C-suites of the firms (Kale, Reis, and Venkateswaran, 2009; Kini and Williams, 2012; Burns, Minnick, and Starks, 2017).⁴ As a result, tournaments have implications in a variety of settings but to date have not been applied to firms beyond the top executives, due in part to data limitations.

Therefore, to evaluate the role of tournaments in the relative compensation of executives compared to both each other and non-executive employees, we focus on the ratio of CEO pay to the average firm employee (i.e., median CEO pay ratio), in addition to other internal pay differential (i.e., traditional tournament) measures, such as Executive Pay Gap, Executive Pay Slice, and Executive Pay Ratios (Bebchuk, et al., 2011; Burns, et al., 2014). Specifically, we analyze how the CEO pay ratio relates to tournament incentives among executives and, therefore, could serve as a proxy for hierarchical pay and incentives beyond the C-suite. We also evaluate whether these pay structures are linked to performance by incentivizing employees through a hierarchical pay structure, both within and beyond the C-suite. Finally, we attempt to explain this performance relation and understand the mechanisms underlying hierarchical pay structure to corporate outcomes.

First, we explore how the Executive Pay Gap, Executive Pay Slice, and ratio of CEO to non-CEO executive pay are linked to the CEO Pay Ratio. We observe a positive relation between

⁴ See e.g., New York Times' "More Than Ever, It Pays to Be the Top Executive," by Eduardo Porter on May 25, 2007, which quotes Mark Van Cleef, a director of MVC Associated International, as saying "it's executive pay chasing executive pay," noting that the compensation gap between the CEO and other executives from top hierarchical echelons would incentivize those underpaid workers to do well: <https://www.nytimes.com/2007/05/25/business/25execs.html>.

tournament incentives and the CEO pay ratio, implying that when CEOs are paid much more than other executives, it is also true relative to non-executive employees. Moreover, this offers evidence that firms employ hierarchical pay structures not just within the C-suite but throughout the firm in order to develop a culture of competition across all employees who may be seeking promotion. In addition, while all tournament incentives are linked with the pay ratio initially, we show that the link is the strongest between the CEO Pay Ratio and Executive Pay Gap, which measures the dollar value of difference between CEOs and other top executives. We also perform principal component analysis to identify the overall tournament structure and observe that the Executive Pay Gap offers distinct information beyond other tournament incentives. The connection between the Executive Pay Gap and CEO Pay Ratio persists after accounting for the level of CEO pay, median employee pay, residual compensation, and other tournament structure measures. This suggests the results are not driven by the level of compensation, the level of median employee pay, expected CEO compensation, or other tournament measures. Instead, the Executive Pay Gap offers information regarding the hierarchical pay structure beyond other measures of compensation and incentives. Moreover, by accounting for residual compensation, our findings suggest the positive relation between the Executive Pay Gap and the CEO Pay Ratio is more closely linked to undercompensated employees at the firm than overpaid CEOs. In additional analysis, we also replace CEO compensation with that of the lowest paid executive, in addition to expanding our analysis to a larger sample by using mean employee compensation data and show our results are robust to a variety of specifications.

Next, we examine firm performance and find that firms with high CEO Pay Ratios and high Executive Pay Gaps also exhibit significantly positive accounting and stock performance, as well as operational efficiency and profitability. These results are strongest when median employees

are highest paid and suggest firms benefit from the incentive structures setup by the firm and the corporate culture connected to hierarchical pay structures. Overall, our findings inform the compensation structure within firms by both linking tournament incentives within the C-suite to the hierarchical pay structure beyond executive compensation and relating hierarchical pay throughout the firm and incentives for employees in general with the performance of the firm.

This study contributes to research on corporate labor markets, as well as the understanding of executive incentives, corporate culture, and determinants of corporate outcomes. By incorporating tournament incentives, we use a novel approach to understanding the relatively unknown pay ratio and offer some of the first understandings of how CEO pay ratios are linked to more efficient firms with improved performance and culture. Though regulators, academics, and the media have long been interested in the ratio of pay between CEOs and other employees, relatively little is known about the ratio. Much of the early research is constrained by limited data with small samples of firms that voluntarily disclose this information. More recently, Boone, Starkweather, and White (2021) analyze Russell 3000 firms and observe that firms take advantage of the Securities and Exchange Commission's (SEC) flexible rules to spin the ratio with longer narratives and more exemptions before disclosing higher than industry average ratios. Surprisingly, they observe that these attempts to contextualize their disclosure are ineffective, with these efforts being followed by more negative media attention, increasing shareholder voting dissent and diminishing productivity. Due to limited research on CEO pay ratios and the recent shift toward regulatory attention in the area, understanding how this ratio is linked to other executive compensation and incentives is a natural and important question.

Moreover, while tournament incentives have been studied substantially at the top of the firm, across industries (Coles, Li, and Wang, 2018) and in countless other settings (Ehrenberg and

Bognanno, 1990; Becker and Huselid, 1992; Adcroft and Teckman, 2009; Brown, 2011; Fee, Hadlock, and Pierce 2006; Brown, Harlow, and Starks 1996; Chen, Hughson, and Stoughton 2011), much less is known about the structure of pay throughout firms and the incentives tied to non-executive compensation, from both upward and downward comparisons. Given that internal mobility is one of the most common forms of promotion and job transition, not just within the C-suite but throughout firms when searching for workers to fill roles, investigating the connection between pay structures at the top and middle of firm compensation levels is central to understanding how firms motivate work forces and provide value to shareholders. This study provides evidence of a link between compensation structures as the top and middle of the firm, in addition to corporate performance. In doing so, this analysis affirms research suggesting corporate culture is set from the top down. We also offer empirical evidence consistent with shareholders benefitting from hierarchical pay structures both within the C-suite and throughout the rest of the firm. The remainder of this paper is organized as follows. Section II introduces the background, while Section III discusses the methodology and results before Section IV concludes.

II. Background and Related Literature

Researchers across a variety of disciplines, from economics and finance to human resources and management, have studied organizational structure and the relation between compensation across different individuals and the performance resulting from a variety of pay structures. In general, firms strive to select optimal CEOs and structure compensation to align incentives of management with those of shareholders (Jensen and Meckling, 1976; Bebchuk and Fried, 2003).

A. Comparison of Equity and Tournament Theories

However, some researchers have developed a theory that draws from the literature of other-regarding preferences within economics, with employees seeking equality and fairness compared

to each other (Bolton and Ockenfels, 2000; Cooper and Kagel, 2016; Finkelstein, Hambrick, and Cannella, 2009; Connelly, Haynes, Tihanyi, Gamache, and Devers, 2016). For example, Cowherd and Levine (1992) suggest differences in pay may reduce employee motivation and discourage effort. Similarly, Becker and Huselid (1992) argue it may lead to excess risk taking to win, which can result in negative outcomes like employee turnover (Bloom and Michel, 2002; Dye, 1984; Gupta et al., 2012; Cornelißen, Himmler, and Koenig, 2011; Bloom, 1999). Some research also provides evidence consistent with equity theory by finding a negative relation between pay dispersion and performance (Fredrickson, Davis-Blake, and Sanders, 2010; Grund and Westergaard-Nielsen, 2008; Siegel and Hambrick, 2005; Blank, Hadley, Minnick, and Rivolta, 2021).

More recently, Edmans, Gosling, and Jenter (2021) indicate that pay is relative to a variety of reference points and external factors, noting that CEOs and corporate stakeholders care about the fairness of pay and perceptions thereof. They even observe that 67% of directors would sacrifice shareholder value to avoid CEO pay controversies, suggesting that the perception of fairness is pivotal to decision-making.

In contrast to the equity theory, some researchers suggest it is firm outcomes that should dictate the compensation-setting process. This led to the development of a literature examining corporate outcomes resulting from competition over pay or so-called tournaments. Tournaments are contests in which candidates compete for prizes awarded by relative rank. The goal is to design a competition that incentivizes those involved to put forth the optimal level of effort (Becker and Huselid, 1992; Lazear, 1999). To maximize employee productivity and firm performance, prizes are often set through high compensation, since relatively small pay raises (i.e., prizes) do not sufficiently motivate competition or could even result in drops in productivity from the tournament

candidates (Knoeber, 1989; Knoeber and Thurman, 1994; Lazear and Rosen, 1981). These findings are consistent with much of the literature on tournament theory documenting corporate benefits from large pay differentials as tournament incentives (Kale, Reis, and Venkateswaran 2009; Kini and Williams 2012; Burns, Minnick, and Starks 2017; Lee, Lev, and Yeo, 2008).

While tournament theory is often studied within the context of top executives, other scholars have also linked pay dispersion and incentive compensation to performance among mutual fund managers (Brown, Harlow, and Starks, 1996; Chen, Hughson, and Stoughton, 2011), professors (Gomez-Mejia, Trevino, and Mixon, 2009), lawyers (Price, 2003), coaches (Fee, Hadlock, and Pierce, 2006), athletes (Frick, 2003), such as golfers (Ehrenberg and Bognanno, 1990) and race-car drivers (Brown, 2011; Becker and Huselid, 1992), football teams (Adcroft and Teckman, 2009), and even drug dealers (Levitt and Dubner, 2009). Researchers also extend analysis of corporate tournaments beyond internal pay structures by investigating how industry and local tournament incentives motivate executives' performance (Coles, Li, and Wang, 2018; Ma, Pan, and Stubben, 2020). As a result, tournament theory may have important implications for any group of individuals competing for an opportunity or prize, including non-executive employees within the firm as well.

B. Early Pay Dispersion Measurement throughout Firms

Compensation data limitations have constrained research from using broad samples with precise measures when studying differences in pay throughout the firm. Some early studies rely on voluntarily disclosed (Cullen and Perez-Truglia, 2022), experimental (Kelly and Seow, 2016), or specific firm (Brown, 1999) or industry data (Crawford et al., 2018), yet find positive implications of pay dispersion (Faleye et al., 2013; Cheng et al., 2017). Other countries sometimes offer data such that Mueller, Ouimet, and Simintzi (2017a) analyze UK firms, while Dittmann,

Montone, and Zhu (2023) examine performance of German firms, with large gaps in wages. However, much of the research on smaller samples of firms, in smaller countries, or using earlier data before CEO pay become such a lightning rod may not be generalizable.

Some of this early research suggests employees may be motivated by the compensation of their managers or higher-ranking employees at the firm as they aspire toward future career goals. However, employees could also be motivated by looking downward at compensation of those at or below their level, which could also induce effort toward self enhancement and higher self-esteem (Goethals and Darley, 1977; Wills, 1981; Chi, Liao, Wang, Zhao, and Ye, 2018; Perez-Truglia, 2020). Further, using matched employer-employee data on nearly 10,000 managers Heyman (2005) finds a positive link between wage dispersion and profit for both executives and rank-and-file workers. Moreover, Faleye et al. (2013) note the importance of not only the CEO's power relative to those with whom the executive works, but also that of employees relative to management, indicating that the hierarchy of pay throughout the firm may be worth studying.

Although data constraints limit research on pay dispersion throughout firms, researchers have used the ratio of the CEO's pay to that of an average executive to proxy for excessive CEO pay. The ratio may indicate whether high compensation of a CEO is the result of effective incentive alignment or rent extraction. Some propose higher pay of CEOs relative to other executives may measure managerial power and harm firm value (Yermack, 1996; Gompers, Ishii, and Metrick, 2003; Bebchuk, Cremers, and Peyer, 2011). Nevertheless, other scholars theorize that high ratios are necessary to retain superior, talented CEOs, where pay differentials of those managers and downward comparison ultimately result in improved efficiency and firm performance (Gabaix and Landier, 2008; Bloom, 2017; Cheng, Ranasinghe, and Zhao, 2017; Ataay, 2019).

Finally, a third group of researchers observes no relation at all (Axelsson and Ulander, 2017), suggesting the empirical question remains unanswered. Gupta, Conroy, and Delery (2012) argue this is due to measurement concerns affecting pay variation studies. For example, Li, Daspit, and Marler (2021) demonstrate the complexity of executive pay dispersion and its impact on the firm by showing that the unexplained portion of pay dispersion is negatively linked to short-term performance, while the explained portion is positively related to long-term firm performance. Overall, the research on pay inequality could benefit from a broader investigation of the hierarchical pay throughout firms and its implications. Given data limitations and selection biases that result from voluntary disclosure, the SEC recently mandated that firms provide the ratio of CEO and employee pay.

C. CEO Pay Ratio Background: CEO and Median Employee Compensation

The ratio of CEO pay to that of the median employee at the firm has become increasingly contentious as focus on pay disparities has risen since the financial crisis (Murphy and Zabojnik, 2004; Gordon and Dew-Becker 2007; Kaplan and Rauh, 2009, 2013; Piketty, 2015; Mueller et al., 2017a; Mueller et al., 2017b). Following the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act, debate regarding disclosing the ratio of CEO and median employee compensation arose as lawmakers sought to avoid a future crisis. In 2015, the SEC passed a rule requiring firms to disclose the ratio of pay between CEO and the average employee beginning for fiscal years that start on or after January 1, 2017. However, some argue the costs of disclosing the ratio exceed the information it provides (Loh, 2016; Parrino, 2016). Further, shareholders may be the ones bearing the costs and consequences from responses to perceived high ratios by rule-makers and other stakeholders. Still, others believe the ratio can inform shareholders regarding low employee

morale, discourage pay practices that lead to the financial crisis, and demonstrate firms' long-term focus (Shorter, 2013; Paulo and le Roux, 2016).

While most researchers have yet to investigate the topic since the rule change, Boone, Starkweather, and White (2021) offer a study on the ratio of CEO pay to median employees following the SEC's rule. They observe that firms attempt to spin the CEO pay ratio by providing longer narratives and using more exemptions before disclosing above average ratios. Boone et al. (2020) find, however, these efforts exacerbate negative media attention, increase shareholder dissent on say-on-pay votes and diminish labor productivity. In addition to the complexity they demonstrate, a related study by Rouen (2020) also shows that the ratio of CEO and median employee pay is multi-faceted, noting that the ratio is not directly linked to performance and, therefore, must be more carefully investigated to understand additional context at the firm to comprehend the implications of pay disparity. Finally, Pan, Pikulina, Siegel, and Wang (2022) provide evidence that investor preferences regarding pay inequality could impact firm value through their rebalancing decisions favoring firms with relatively low CEO pay ratios. As a result, researchers may need to analyze multiple pay dispersion measures to study the hierarchical pay structure at the firm.

Given the controversy surrounding this new ratio and uncertainty regarding firm decision-making, additional analysis is imperative to an informed decision for rule makers moving forward. With the limitations of prior research on hierarchical compensation and new information regarding the compensation of CEOs relative to median employees, researchers have a new opportunity to provide a more comprehensive review of compensation throughout firms. Further, the ratio of pay between CEOs and the median employee may proxy for the overall hierarchical nature of compensation structure throughout the firm. Additionally, the structure of compensation among

CEOs, other executives and the remaining employees may be related to incentivizing productivity. Overall, the relation between the CEO pay ratio, executive pay structure, and hierarchical pay with corporate culture and firm performance remains an open empirical question, which this study investigates.

III. Methodology and Results

To explore hierarchical compensation and tournament incentives, we use Compustat's ExecuComp database covering current and former S&P 1500 firms. These data allow us to analyze and understand the information provided by disclosure of a firm's ratio of pay for the CEO relative to median employee as well as executive incentives and the resulting link to CEO compensation relative to other employees. We merge ExecuComp with Equilar data on the median employee pay, CEO pay, and CEO pay ratio, which measures the ratio of CEO pay to median employee pay for Russell 3000 companies beginning with the recent requirement for firms to disclose this information. Given that the SEC requires disclosure of the ratio beginning with the 2018 proxy filing season and the health crisis impacts the analysis beginning in 2020, the main sample is limited to, at most, three years for firms in our sample, since only a few firms disclose this information voluntarily the year prior to the mandate. Control variables, including stock returns and accounting information are collected from CRSP and Compustat. Using these data, we can also control for the effects related to firm and CEO characteristics. Table 1 summarizes the sample of 6,189 firm-year observations.

The mean (median) executive compensation for the sample is \$7,547,337 (\$5,193,846), while the median employee compensation for the sample is \$82,200 (\$64,730), resulting in an average ratio of 161 (76). The mean (median) of total assets is \$19,208 (\$2,783) thousand and the

mean (median) book to market ratio is 0.65 (0.66). The sample of firms is relatively complex, with leverage of 28% of assets, and the mean (median) number of segments equal to 3 (2).

The average CEO in the sample is 58 years old with a tenure of approximately 10 years and cash compensation accounting for approximately one quarter of the CEO's pay. The mean tournament structure variables suggest that CEOs' pay accounts for 28.5% of all executive compensation at the firm (as a percentage of top five executives). Moreover, CEO makes 2.3 times more than the average non-CEO executive, with the mean (median) executive pay gap of \$2,714.5 (\$1,965.4) thousand. About 38% of CEOs in the sample also serve on the board of directors.

A. Univariate Comparison of Firm Characteristics by CEO Pay Ratio

Next, we examine the univariate correlations and present the results in Table 2, which documents that CEO pay ratios are positively correlated with firm size (sales and market capitalization), ROA, leverage, firm age, and firm complexity, but negatively correlated with CEO tenure. This is consistent with the idea that we will explore within our multivariate regression analyses, where non-CEO executives and average workers are motivated to produce and help the firm perform well through hierarchical pay structures. We also observe that all tournament structure variables are positively and significantly correlated with each other. Finally, the median employee pay is negatively correlated with firm revenue, ROA, book-to-market, firm age, complexity, and (not surprisingly) CEO pay ratio, while it is positively linked to market capitalization.⁵

To begin our analysis of the ratio of CEO and median employee pay, we perform a univariate comparison of the sample by bifurcating on the median CEO pay ratio to compare above

⁵ Since the median employee pay is the denominator of CEO pay ratio (ratio between the pay of the CEO and that of median employee at the firm), we should observe a negative relation as we observe the positive link between CEO pay ratios and variables that measure firm characteristics.

and below median firms. The results in Table III suggest the firms are different in nearly every way. Firms with above median CEO pay ratios have median employee pay of \$60,130 compared to \$103,811 for low ratio firms. Moreover, CEO pay is approximately three times larger at high ratio firms, while the ratio is more than seven times as large for firms with above median ratios. Interestingly, when low CEO pay ratio and high CEO pay ratio firms are compared across measures of firm outcomes, the latter outperforms at statistically significant levels. Firms with higher pay ratios are larger and more profitable, with more segments and higher Herfindahl measures, while using more leverage and stock options. Firms with high CEO pay ratios also have higher residual compensation and tournament incentives. Given the differences in firm traits, we now proceed to multivariate analysis to account for these differences in characteristics.

B. *Multivariate Analysis of CEO Pay Ratios and Tournament Incentives*

We investigate the role of tournament structure incentives in relative compensation of CEOs and other non-executive employees using the following pooled ordinary least squares multivariate regression model:

$$\begin{aligned}
 \text{CEO Pay Ratio}_{it} = & \lambda_0 + \lambda_1 \text{Tournament Incentives}_{it-1} + \lambda_2 \text{Log(Sales)}_{it-1} + \lambda_3 \text{Leverage}_{it-1} \quad (1) \\
 & + \lambda_4 \text{Firm Segments}_{it-1} + \lambda_5 \text{Market-to-Book}_{it-1} + \lambda_6 \text{ROA}_{it-1} \\
 & + \lambda_7 \text{CEO Director}_{it-1} + \lambda_8 \text{Herfindahl}_{it-1} \\
 & + \lambda_9 \text{Executive Experience}_{it-1} + \sum \text{Year}_{t-1} + \sum \text{Industry}_i + \mu_{it}
 \end{aligned}$$

For our initial empirical analysis, tournament incentives include the (1) Executive Pay Gap, dollar difference between the CEO and firm’s next three highest paid executives, (2) Executive Pay Ratio (Mean), the ratio of the CEO’s pay to the mean of the next four highest paid executives, (3) Executive Pay Ratio (Median), the ratio of the CEO’s pay to the median of the next four highest

paid executives, and (4) Executive Pay Slice, the percentage of the top five highest paid executive's compensation that the CEO receives. Table 4 presents the results.

In Panel A, Column 1 documents a positive (0.00419) and significant (p -value < 0.001) relation between the executive pay gap and the ratio of the CEO to median employee pay. The coefficient implies that one unit standard deviation increase in executive pay gap will lead to an increase of 16.8% in its mean or an increase of 4.6% of standard deviation of CEO pay ratio, which is an economically large increase. Columns 2 through 4 document similarly positive and significant (p -values < 0.0129) relations for the remaining tournament incentive variables. Column 5 relates all tournament incentive variables and demonstrates the relation is the strongest for the executive pay gap, with the economic magnitude being even larger after accounting for the impact of other tournament structure measures.⁶ Panel B performs similar analysis utilizing log transformations of tournament incentives variables and continues to document similarly positive and significant relations between tournament incentives and the CEO pay ratio, with the executive pay gap being the most significant. Log transformations also alleviate concerns related to the forms the different variables take. For example, one might note that the executive pay gap in its raw dollar form would ignore relative magnitudes of gaps in pay, by taking the log transformation of this variable, we effectively incorporate the fact that that at higher levels the same dollar difference would have a smaller impact. As a result, this variation of the analysis limits some critiques for specific tournament measures. Moreover, by incorporating each variable separately and

⁶ To assess multicollinearity concerns, we also evaluate variance inflation factors (VIF). The results indicate that multicollinearity is not a significant factor within the model. Specifically, we find that the highest VIF is close to 8, which is not statistically significant at the 10% threshold. Moreover, most variables within most of the analyses throughout the paper are less than 5 (or even 2 or 3, for that matter). Given that the results and conclusions of our analysis are neither driven by a single model nor substantively altered by a single specification, we deem our current model selection reasonable. We also examine the information coefficients of each model and observe that most are similar and the relation varies across specifications, indicating that the relations between the variables is complex, which is not surprising given corporate finance and incentive setting processes.

concurrently, we are able to learn how robust these relations are.⁷ While it is common to add one to variables when employing log transformations, it is worth noting that to employ the log transformation for the executive pay gap, we have to add more than one. This is due to the negative values in instances where CEO compensation is lower than that of other executives, often resulting from CEOs taking very small or no compensation for a time. This leads to larger coefficients for the executive pay gap, however the findings and conclusions are unchanged.

C. *CEO Pay Ratios and Firm Performance*

Having established a link between tournament incentives and the CEO pay ratio, we now investigate the implications for firm performance. To compare high and low gap and ratio firms, we bifurcate the sample by median pay gaps and ratios. Specifically, we investigate the performance implications of the link between tournament structure incentives and relative compensation of CEOs and other non-executive employees using the following pooled ordinary least squares multivariate regression model:

$$\begin{aligned}
 Performance_{it} = & \lambda_0 + \lambda_1 High\ CEO\ Pay\ Ratio_{it-1} + \lambda_2 High\ Executive\ Pay\ Gap_{it-1} & (2) \\
 & + \lambda_3 High\ CEO\ Pay\ Ratio * High\ Executive\ Pay\ Gap_{it-1} \\
 & + \lambda_4 Firm\ Segments_{it-1} + \lambda_5 Market-to-Book_{it-1} + \lambda_6 ROA_{it-1} \\
 & + \lambda_7 CEO\ Director_{it-1} + \lambda_8 Herfindahl_{it-1} \\
 & + \lambda_9 Executive\ Experience_{it-1} + \lambda_{10} Tournament\ Incentives_{it-1} \\
 & + \lambda_{11} Log(Total\ Compensation)_{it-1} + \lambda_{12} Log(Sales)_{it-1} \\
 & + \lambda_{13} Leverage_{it-1} + \sum Year_{t-1} + \sum Industry_i + \mu_{it}
 \end{aligned}$$

⁷ For additional analysis, see e.g., Tables 9 and 10, where we both expand the sample using mean compensation, replace CEO compensation with that of the lowest paid executive and account for the levels of both the median employee and CEO pay to decompose the impact, in addition to developing a principal component analysis incorporating all tournament incentives collectively. Overall, these relations continue to be robust and persistent throughout our analyses, indicating the relations are not driven by a limited set of factors.

We define Performance as five different measures, where each is included within a separate column of the Table including (1) Return on Assets, (2) Profit Margin, (3) Total Asset Turnover, (4) Equity Multiplier, and (5) Buy and Hold Abnormal Return. Table 5 presents the analysis of performance and efficiency for firms with high executive pay gaps and high CEO pay ratios.

The results in column 1 suggest that, while high ratios of CEO to median employee pay are positively (coefficient = 0.0104) and significantly (p-value = 0.0687) related to firm accounting performance, the interactive impact of high CEO pay ratios and high executive pay gaps is economically larger (coefficient = 0.0221) and even more significant. These findings suggest that firms with higher CEO pay ratios have 1% higher ROA, while the interactive impact of both CEO high pay ratios and executive pay gaps has ROA over 2.2%.

We further investigate the relation between executive pay gap and CEO pay ratio and firm performance by decomposing the return on assets into total asset turnover and profit margin. Columns 2 and 3 show a positive (coefficients = 0.102; 0.0815, respectively) and significant (p-values < 0.05) link with high executive pay gaps and components of firm performance, namely profitability and efficiency. Similarly, firm profitability is positively linked to the ratio of CEO and median employee pay in column 2. Moreover, in both columns 2 and 3, we observe a positive interactive effect of high executive pay gaps and CEO pay ratios with profit margins, as well as total asset turnover. This implies that incentives generated via a larger pay dispersion throughout the firm's hierarchy are linked with not only better performance and profitability but also higher efficiency. Finally, columns 4 and 5 examine firm capital structure and stock performance, illustrating that the interaction of high CEO pay ratios and executive pay gaps are also linked to higher firm leverage and better stock market performance. Taken together, these results suggest that firms with both high executive pay gaps and high CEO pay ratios could create a culture of

incentives and hierarchical pay structures that lead to more efficient and profitable firms that employ riskier capital structures, resulting in higher accounting and stock performance. Overall, the findings in Table 6 imply that corporate performance benefits from the combination of high executive pay gaps and high CEO pay ratios via more efficient operations and superior profitability.

Next, in order to better understand the mechanism driving firm accounting performance, we examine the role the level of median employee pay plays. Ziano, Lembregts, and Pandelaere (2022) conduct five experiments with U.S. American and French participants to show people use median salaries more than ratios of CEO to median employee pay to assess fairness of compensation. As a result, in Table 6, we bifurcate the sample at the median to separately look at firms with high and low median employee pay and perform similar analyses to those presented in Table 5. Columns 1 and 2 examine return-on-assets for firms compensating their employees above and below median levels, while columns 3 and 4 perform similar analyses of return-on-equity. Columns 5 and 6 analyze firm profit margins. The results in column 1 indicate that firms with highly (i.e., above median) paid median employees have positive (coefficient = 0.0277) and significant (p -value < 0.1) links between return-on-assets and both the CEO pay ratio and the interaction of the pay ratio with the executive pay gap. This suggests the firms with more highly paid employees benefit from the tournament incentives of hierarchical pay. On the other hand, column 2 shows this relation does not exist for firms with below median employee compensation. The results are similar in columns 3 and 4 for return-on-equity, while columns 5 and 6 also present similar relations for firm profit margins, indicating that firms where employees are paid higher but also potentially face compensation tournaments exhibit higher return-on-equity as well as higher profitability. Overall, this analysis suggests that firms with hierarchical pay structures and higher

paid employees are able to more effectively motivate them to create a culture that contributes to firm performance.

We also seek to explore the mechanism explaining how performance is linked to hierarchical pay. First, we examine investments in research and development and acquisitions, as well as selling, general and administrative (SG&A) expenses. Table 7 presents the results. Columns 1 and 2 analyze research and development, while columns 3 and 4 present the results assessing acquisitions, before the final two columns analyze SG&A expenses. Column 1 indicates that research and development is not significantly different for firms with stronger hierarchical pay structures and highly paid employees. On the other hand, column 2 suggests those firms with lower paid employees coupled with strong hierarchical pay structures have significantly lower research and development. This could be consistent with rent extraction or firms reallocating investments away from research toward employees at the top of the firm. Moreover, in columns 3 and 4, we perform a similar analysis with acquisitions and observe that firms with highly paid employees and hierarchical pay structures invest significantly more in acquisitions, while those with lower paid employees do not. In the final two columns of the table, we find that the higher accounting performance is not driven by lower SG&A expenses. Instead, we find that firms with below median compensation for their median employee also have higher SG&A expenses, as opposed to cutting all costs. These results suggest that firms with higher paid employees and hierarchical pay structure invest relatively higher volumes in acquisitions, while other firms invest less in research and development. Overall, these findings indicate firms can effectively motivate employees within high investment firms, seeking to improve firm performance and growth.

D. CEO Pay Ratios and Excess Compensation

Given the robust link between tournament incentives and the ratio of pay between CEOs and non-executive employees, we now investigate the connection of expected and residual compensation with tournament incentives and the CEO pay ratio. Table 8 presents the results. Column 1 analyzes the connection between CEO pay ratio and excess compensation, which is the residual of total and expected compensation following an approach similar to Core et al. (2008) to estimate the expected compensation a CEO would receive on average based on the firm's size, performance, and other relevant characteristics. The results show a positive (coefficient = 0.00478) and significant (p-value < 0.001) relation between our measure of excess compensation and the CEO pay ratio. The one difference between the measure employed in Column 1 and that of Core et al. (2008) is that tenure is excluded from the model to utilize a larger sample for analysis. Column 2 performs the same analysis utilizing the residual compensation that does incorporate CEO tenure and continues to document a positive (coefficient = 0.00398) and significant (p-value < 0.001) relation between excess compensation and the CEO pay ratio. Column 3 repeats this analysis accounting for the level of CEO compensation and provides similar results, documenting a positive (coefficient = 0.00220) and significant relation between excess compensation and the CEO pay ratio. The results in column 4 are similarly positive; however, the p-value is no longer statistically significant. Finally, Column 5 incorporates tournament incentives and documents that the relation between excess compensation and the CEO pay ratio is no longer significant, while the relation between the executive pay gap and the CEO pay ratio continues to be positive and significant. These findings suggest that the CEO pay ratio is not driven by overpaid CEOs as much as by non-CEOs who are compensated relatively lower and incentivized by the hierarchical structure of pay. Overall, these results continue to document the important relation between

tournament incentives, as measured by the executive pay gap, and the ratio of pay between CEOs and median firm employees.

E. CEO Pay Ratio Components and Tournament Factors

Next, recognizing the similarities across tournament structure measures, we seek to analyze the shared components of tournament incentives compared to the individual measures to discern whether the executive pay gap simply measures facets of each tournament structure variable together. To do so, we standardize each variable and perform principal component analysis of the four tournament structure measures. One step in principal component analysis is to review the correlations across the measures, which we already noted are positive and significant, with all exceeding 0.55 and three correlations exceeding 0.90. The initial factor procedure estimates the principal factors using squared multiple correlations with prior communality estimates resulting in 0.88, 0.32, 0.96, and 0.95, respectively for the pay slice, pay gap, mean pay ratio and median pay ratio. This suggests the pay gap has the least in common with the others, potentially explaining some of the differences across variables within the prior analysis. The resulting first factor has a proportion of 1.0096 and is therefore the only one retained. It contains a factor pattern of 0.94, 0.56, 9.99, and 0.97 for pay slice, pay gap, mean ratio, and median ratio, respectively. When scoring the standardized coefficients, the first factor leads to 0.14, 0.02, 0.61, and 0.24 for the pay slice, gap, mean ratio, and median ratio, respectively. Four similar methods were also considered and offer similar results. Table 9 presents the analysis.

Overall, the results and conclusions are consistent with those of the prior analysis. The tournament structure principal component is not significant throughout and the sign alternates. Despite its presence, each individual tournament incentive measure continues to be positive and significant until all are included in the final model, at which point the executive pay gap is the only

variable that continues to be significant. Panel B demonstrates similar analysis using tournament incentives after log transformations are performed. The results persist and conclusions remain unchanged. The analysis supports the prior models, which document positive and significant relations between tournament incentives and CEO pay ratios, largely driven by the executive pay gap, suggesting the dollar difference between CEOs and other executives is the most predictive measure of the ratio of CEO compensation to that of the median firm employee's compensation.

Next, we explore whether tournament incentives are informative regarding the ratio of CEO pay to that of the median employee after controlling for the level of pay of the median employee (Panel C) and CEO (Panel D) in Table 9. The results of Panel C demonstrate that tournament incentives continue to be positively and significantly linked to the CEO pay ratio, even after accounting for the negative link between median employee pay and the CEO pay ratio. Moreover, the economic magnitude continues to be at least as large, suggesting tournament incentives capture a corporate pay structure distinct from the level of compensation. Columns 1 to 4 show a positive (coefficients = 0.0048; 7.650; 7.694; 145.5, respectively) and significant (p-values < 0.001) link with each measure of tournament structure and the ratio of pay between CEOs and median employees. The results indicate each measure of tournament structure is positively and significantly related to the ratio of pay between CEOs and median employees. Still, the executive pay gap seems to have the most prominent relation. Panel D provides similar results, confirming the relations are not driven by the level of CEO compensation either. Column 1 shows a positive (coefficient = 0.00306) and significant (p-values < 0.01) relation between executive pay gap and the ratio of CEO to median employee pay. The results for other measures of tournament incentives suggest that the link with CEO pay ratio may be largely driven by the level of CEO compensation, indicating that, unlike executive pay gap, these tournament incentives measures

may not provide sufficiently new information. Consequently, we focus on the executive pay gap for the remaining analysis. In additional untabulated analysis, we observe similar results when incorporating each component together in the same analysis. These results suggest tournament incentives remain significant predictors of the CEO pay ratio, even beyond the link with the individual pay level components of the ratio.

F. Executive Pay Ratios and Average Employee Compensation

Finally, given the limitations of the current sample, we employ two alternative measures to identify the robustness of the relations we analyze. In particular, we follow Faleye et al. (2013), to compute the mean employee compensation and extend the sample to incorporate earlier periods and more than double the size.⁸ This approach also allows us to assess our methodology by comparing data from the prior literature. In Table 10, we begin by repeating the analysis in Table 4 using this new, broader measure and observe similar results, with executive tournament incentives being positively and significantly linked to the broader pay ratio, which is shown in Panel A. Moreover, when tournament measures are assessed together, the Executive Pay Gap continues to be positively (coefficient = 0.00922) and significantly (p-value < 0.001) linked to the pay ratio, while the Executive Pay Slice and Executive Pay Ratio (Median) are no longer positive and significant. However, the Executive Pay Ratio (Mean) continues to exhibit a positive (coefficient = 19.23) and statistically significant (p-value < 0.001) coefficient, indicating that, with a broader sample and more statistical power, the relation may be informative, even though the p-value is larger than that of the Executive Pay Gap, which could indicate the difference between the strength of the relations.

⁸ Given that these data are not required to be reported, the sample size is limited. As a result, Faleye et al. (2013) examine sample selection concerns and find the firms are reasonably similar to those from ExecuComp. Our sample is extended beyond their period but has similar dynamics.

Given that the sample is larger and each firm has more years included within the extended sample, we also employ firm fixed effects to examine within-firm variation. Panel B of Table 10 present the results. The results and conclusions persist, suggesting the findings of our paper are not only the result of a comparison across different firms but that the differences within firms across time are similarly important, albeit with some coefficient magnitudes muted in select instances. Still, the results are both quantitatively and qualitatively similar.

As a final additional analysis, we recognize that the compensation of the chief executive officer may be an imperfect comparison for the ratio of pay to other employees. As a result, we substitute the lowest executive compensation within the ratio and perform the same analyses as above. Panel C of Table 10 presents the results, which document similarly positive and significant relations between the Executive Pay Gap and the pay ratio. We also repeat this analysis with firm fixed effects in Panel D of Table 10 and continue to observe the same positive and significant relation between the Executive Pay Gap and the pay ratio. Overall, these results indicate that our findings are not the result of one measure, empirical approach or comparison. Instead, these findings and conclusions continue to hold for a variety of alternative approaches and measures, indicating the link between tournament incentives and hierarchical pay structure is both persistent and robust.

IV. Conclusion

We investigate how firms structure pay throughout the firm to incentivize performance. Specifically, we evaluate the impact of pay dispersion and employee morale throughout the firm through the lens of tournament incentives and pay ratios, assessing the impact hierarchical pay structures have on firm performance. The SEC mandate to disclose the CEO pay ratio, ratio between the pay of the CEO and that of the firm's median employee, allows us to analyze U.S.

firms and expand our understanding of relative compensation, tournament incentives, and firm performance. The CEO pay ratio is positively related to tournament incentives, suggesting that when CEOs are paid more than other executives, it is also true relative to non-executive employees. This result is consistent with the idea that firms employ hierarchical pay structures to incentive promotion and career advancement, not only within the C-suite but also throughout the firm. Moreover, hierarchical pay incentivizes firm employees who look downwardly for motivation as well (Chi, Liao, Wang, Zhao and Ye, 2018; Carter, LaViers, Sandvik and Xu, 2023).

When we assess performance implications of the link between tournament incentives and CEO pay ratio, firms with high CEO pay ratios and high executive pay gaps exhibit higher accounting and stock market performance, as well as more efficient and profitable operations relying on more leverage. The results are driven by firms with well paid employees, which invest more in acquisitions, while firms with lower paid employees have lower research and development. Moreover, the executive pay gap is most closely related to the CEO pay ratio, which persists after accounting for the levels of median employee and CEO pay, as well as excess CEO compensation, implying the executive pay gap informs the hierarchical pay structure beyond other measures of compensation and incentives. Further, the CEO pay ratio is not the result of excess compensation, such that the positive relation between the executive pay gap and the CEO pay ratio is not driven by overpaid CEOs but more likely tied to other undercompensated employees.

We contribute to understanding labor markets and the role of incentives within a firm to motivate employees outside the C-suite to efficiently produce. Corporate cultures set from the top down to emphasize hierarchical pay structures throughout the firm positively impact performance and shareholder wealth, particularly when employees are well-paid. Our findings improve the firms' cost-benefit analysis of incentivizing competition for promotion, not simply for the CEO

position but throughout the firm. This also informs firm decisions to bear costs of high pay dispersion receiving negative media attention, given firms may benefit through better performance. Tournament incentives and comparisons throughout the firm are central to understanding the relation between CEO pay and that of other non-executive employees, offering insight into research on labor and incentives. Corporate performance is linked to this connection, which informs shareholders on the link between firm culture and other corporate outcomes, which are also important for other stakeholders. Overall, these findings inform compensation structures within firms by both linking tournament incentives inside the C-suite to the hierarchical pay structure for non-executive employees, as well as relating hierarchical pay throughout the firm (both within the top executives and outside thereof) with the performance of the firm.

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Table 1 – Summary Statistics

Table 1 presents summary statistics for the sample, including firm and executive characteristics. Executive compensation details are presented in thousands of US dollars. Data come from Compustat for financial and accounting information, CRSP for stock performance, and Equilar for CEO Pay ratio and median employee compensation information, while ExecuComp contains information on executive characteristics and compensation. Numbers are formatted such that negative numbers are indicated parenthetically, while hyphens indicate values equal to zero. More detailed definitions for variables are included in the Appendix.

| Variable | N | Mean | Std. Dev. | Percentile | | |
|---------------------------------------|-------|-----------|-----------|------------|----------|----------|
| | | | | 25th | Median | 75th |
| Median Employee Compensation | 6,178 | 82,200 | 63,975 | 45,050 | 64,730 | 100,926 |
| CEO Compensation | 6,189 | 7,547 | 30,000 | 2,707 | 5,194 | 9,238 |
| CEO to Median Employee Pay Ratio | 6,189 | 161 | 592 | 36 | 76 | 157 |
| Corporate Revenue | 6,168 | 6,256 | 21,137 | 403 | 1,261 | 4,102 |
| Firm Assets | 6,169 | 19,208 | 108,618 | 964 | 2,783 | 8,884 |
| Log (Sales) | 6,167 | 7.11 | 1.91 | 6.00 | 7.14 | 8.32 |
| Market-to-Book Ratio | 6,158 | 2.19 | 2.45 | 1.13 | 1.54 | 2.40 |
| Return-on-Assets | 6,168 | 0.014 | 0.170 | 0.007 | 0.029 | 0.067 |
| Book-to-Market Ratio | 6,152 | 0.65 | 0.29 | 0.42 | 0.66 | 0.90 |
| Market Capitalization | 6,161 | 11,790.25 | 41,288.90 | 874.60 | 2,377.07 | 7,314.22 |
| Leverage | 6,148 | 0.28 | 0.25 | 0.08 | 0.25 | 0.41 |
| R&D Ratio | 3,227 | 4.34 | 86.50 | - | 0.02 | 0.13 |
| Salary | 4,238 | 708 | 435 | 415 | 633 | 950 |
| Stock Awards | 4,238 | 2,606 | 4,412 | 381 | 1,257 | 3,250 |
| CEO Ownership | 3,992 | 1.2 | 3.9 | 0.1 | 0.2 | 0.7 |
| CEO Age | 4,234 | 58.0 | 7.6 | 53.0 | 58.0 | 62.0 |
| Exercisable CEO Unexercised Options | 4,201 | 7,456.4 | 40,041.1 | - | - | 2,056.8 |
| Unexercisable CEO Unexercised Options | 4,201 | 1,287.3 | 5,723.3 | - | - | 446.8 |
| Total CEO Pension Value | 4,201 | 2,186.7 | 7,428.4 | - | - | 118.8 |
| Cash Percentage of Compensation | 4,196 | 0.29 | 0.21 | 0.14 | 0.23 | 0.37 |
| CEO Tenure | 2,131 | 10.42 | 8.80 | 4.06 | 8.09 | 14.01 |
| Salary and Bonus Compensation | 4,238 | 834.3 | 996.4 | 437.7 | 683.0 | 1,000.0 |
| Equity Compensation | 4,196 | 2,845.5 | 4,875.9 | 348.5 | 1,275.6 | 3,600.2 |
| Stock Performance | 5,870 | 17.2 | 571.1 | (0.3) | 0.2 | 1.8 |
| Firm Age | 5,911 | 25.6 | 19.6 | 11.0 | 22.0 | 33.0 |
| Size and Industry Adjusted ROA | 6,168 | (0.019) | 0.163 | (0.022) | - | 0.025 |
| Size and Industry Adjusted Return | 5,870 | 14.3 | 560.3 | (0.3) | - | 0.6 |
| Firm Mean Compensation | 2,557 | 2,714.5 | 3,439.8 | 1,216.4 | 1,965.4 | 3,212.3 |
| Executive Pay Ratio (Mean) | 2,528 | 2.3 | 3.2 | 0.9 | 1.5 | 2.9 |
| Executive Pay Ratio (Median) | 2,522 | 2.4 | 3.2 | 1.0 | 1.6 | 3.1 |
| Pay Gap | 2,614 | 2,180.6 | 6,463.6 | (240.6) | 716.4 | 3,656.5 |
| Pay Slice | 2,306 | 0.285 | 0.193 | 0.135 | 0.224 | 0.413 |
| CEO Director | 6,189 | 0.377 | 0.485 | - | - | 1.000 |
| Firm Segments | 5,496 | 3.0 | 1.9 | 2.0 | 2.0 | 4.0 |
| Herfindahl | 4,213 | 0.264 | 0.227 | 0.103 | 0.196 | 0.354 |
| Executive Experience | 4,123 | 0.379 | 0.485 | - | - | 1.000 |
| Firm Complexity | 5,473 | (0.122) | 0.614 | (0.524) | (0.154) | 0.231 |

Table 2 – Correlation Matrix

Table 2 provides correlations for firm and executive characteristics for the sample of firm and executive characteristics, including the ratio of CEO to median employee pay using listwise deletion. Variable definitions are included in the Appendix. P-values are presented in parentheses below the coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

| | Median Employee Pay | CEO Pay | CEO Pay Ratio | Log (Sales) | Return-on-Assets | Book-to-Market Ratio | Market Capitalization | Leverage | CEO Tenure | Stock Performance | Firm Age | Executive Pay Ratio (Mean) | Pay Gap | Pay Slice | Executive Experience |
|---------------|----------------------|----------------------|----------------------|---------------------|----------------------|----------------------|-----------------------|----------------------|----------------------|---------------------|----------------------|----------------------------|---------------------|----------------------|----------------------|
| CEO Pay | 0.015 (0.244) | 1.000 | | | | | | | | | | | | | |
| Pay Ratio | -0.149*** (0.000) | 0.892*** (0.000) | 1.000 | | | | | | | | | | | | |
| Log (Sales) | -0.310*** (0.000) | 0.138*** (0.000) | 0.171*** (0.000) | 1.000 | | | | | | | | | | | |
| ROA | -0.336*** (0.000) | 0.017 (0.176) | 0.051*** (0.000) | 0.412*** (0.000) | 1.000 | | | | | | | | | | |
| Book/Market | -0.126*** (0.000) | -0.039*** (0.002) | -0.047*** (0.000) | 0.083*** (0.000) | 0.027** (0.828) | 1.000 | | | | | | | | | |
| Market Cap | 0.043*** (0.001) | 0.122*** (0.000) | 0.072*** (0.000) | 0.412*** (0.000) | 0.087*** (0.000) | -0.118*** (0.000) | 1.000 | | | | | | | | |
| Leverage | -0.006 (0.639) | 0.029** (0.022) | 0.046*** (0.000) | 0.166*** (0.000) | -0.003 (0.828) | -0.035*** (0.006) | 0.014 (0.279) | 1.000 | | | | | | | |
| CEO Tenure | -0.042* (0.053) | -0.033 (0.125) | -0.054** (0.013) | -0.038* (0.077) | 0.066*** (0.002) | -0.029 (0.176) | 0.001 (0.975) | -0.136*** (0.000) | 1.000 | | | | | | |
| Stock Returns | -0.001 (0.936) | 0.004 (0.746) | 0.009 (0.508) | 0.011 (0.386) | 0.000 (0.988) | -0.017 (0.198) | -0.005 (0.704) | 0.037*** (0.005) | -0.035 (0.108) | 1.000 | | | | | |
| Firm Age | -0.130*** (0.000) | 0.034*** (0.008) | 0.042*** (0.001) | 0.358*** (0.000) | 0.149*** (0.000) | 0.017 (0.180) | 0.204*** (0.000) | -0.025* (0.051) | 0.031 (0.149) | -0.003 (0.790) | 1.000 | | | | |
| Mean Ratio | 0.005 (0.792) | 0.007 (0.728) | 0.006 (0.764) | 0.025 (0.205) | 0.017 (0.399) | -0.062*** (0.002) | 0.001 (0.951) | 0.044** (0.028) | -0.058** (0.036) | 0.128*** (0.000) | 0.024 (0.228) | 1.000 | | | |
| Pay Gap | -0.002 (0.928) | 0.022 (0.262) | 0.020 (0.297) | 0.140*** (0.000) | 0.011 (0.571) | -0.021 (0.287) | -0.065*** (0.001) | 0.065*** (0.001) | -0.088*** (0.001) | 0.069*** (0.000) | 0.070*** (0.000) | 0.627*** (0.000) | 1.000 | | |
| Pay Slice | -0.033 (0.110) | -0.007 (0.728) | -0.006 (0.777) | 0.076*** (0.000) | 0.026 (0.207) | -0.024 (0.248) | 0.001 (0.973) | 0.030 (0.145) | -0.122*** (0.000) | 0.016 (0.460) | 0.089*** (0.000) | 0.888*** (0.000) | 0.613*** (0.000) | 1.000 | |
| Experience | -0.002 (0.875) | 0.091*** (0.000) | 0.059*** (0.000) | 0.103*** (0.000) | -0.063*** (0.000) | 0.021 (0.180) | 0.029* (0.060) | 0.052*** (0.001) | -0.203*** (0.000) | -0.003 (0.867) | -0.073*** (0.000) | 0.004 (0.839) | -0.020 (0.310) | -0.077*** (0.000) | 1.000 |
| Complexity | -0.339*** (0.000) | 0.106*** (0.000) | 0.127*** (0.000) | 0.859*** (0.000) | 0.336*** (0.000) | 0.182*** (0.000) | 0.345*** (0.000) | 0.207*** (0.000) | -0.039* (0.081) | 0.006 (0.674) | 0.395*** (0.000) | 0.013 (0.532) | 0.104*** (0.000) | 0.070*** (0.001) | 0.083*** (0.000) |

Table 3 – Univariate Comparison by CEO Pay Ratio

Table 3 summarizes firm and executive characteristics for the sample by the ratio of CEO to median employee pay. Samples are bifurcated at the CEO Pay Ratio Median of 76. Executive compensation details are presented in thousands of US dollars. Variable definitions are included in the Appendix. Robust two-tailed t-statistics are presented in parentheses below the coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|-------------------------------------|---------------|-----------|----------------|------------|------------|-------------|
| | Low Pay Ratio | | High Pay Ratio | | Difference | |
| | N | Mean | N | Mean | (4) – (2) | T-Statistic |
| Median Employee Pay | 3,094 | 103,811 | 3,075 | 60,130 | (43,681) | 28.76*** |
| CEO Pay | 3,100 | 3,472,640 | 3,080 | 11,700,000 | 8,227,360 | 10.81*** |
| CEO Pay Ratio | 3,100 | 37 | 3,080 | 285 | 247 | 16.77*** |
| Corporate Revenue | 3,089 | 1,401 | 3,070 | 11,153 | 9,752 | 18.59*** |
| Firm Assets | 3,089 | 4,739 | 3,071 | 33,804 | 29,065 | 10.59*** |
| Net Income | 3,089 | 90.94 | 3,070 | 914.13 | 823.19 | 15.07*** |
| Log (Sales) | 3,088 | 6.02 | 3,070 | 8.21 | 2.19 | 54.93*** |
| Return-on-Assets | 3,089 | (0.02) | 3,070 | 0.05 | 0.06 | 14.86*** |
| Book-to-Market Ratio | 3,083 | 0.67 | 3,060 | 0.63 | (0.04) | 5.58*** |
| Market Capitalization | 3,087 | 3,791.19 | 3,065 | 19,872.39 | 16,081.20 | 15.56*** |
| Leverage | 3,077 | 0.24 | 3,062 | 0.32 | 0.07 | 11.56*** |
| R&D Ratio | 1,478 | 9 | 1,744 | 1 | (8) | 2.56** |
| Salary | 1,656 | 533 | 2,576 | 820 | 287 | 23.79*** |
| Stock Awards | 1,656 | 1,280.5 | 2,576 | 3,401.8 | 2,121.3 | 16.38*** |
| CEO Ownership | 1,567 | 1.6 | 2,428 | 1.1 | (0.5) | 3.85*** |
| CEO Age | 1,656 | 57.5 | 2,576 | 58.4 | 0.9 | 3.53*** |
| Exercisable Unexercised Options | 1,642 | 3,826.0 | 2,556 | 10,156.1 | 6,330.1 | 4.7*** |
| Unexercisable Options | 1,642 | 814.4 | 2,556 | 1,578.3 | 763.9 | 4.27*** |
| Total CEO Pension Value | 1,642 | 729.3 | 2,556 | 3,149.6 | 2,420.2 | 10.43*** |
| CEO Compensation (Execucomp) | 1,642 | 2,639.54 | 2,556 | 6,400.25 | 3,760.71 | 21.28*** |
| Cash Percentage of Compensation | 1,639 | 0.36 | 2,555 | 0.24 | (0.11) | 17.41*** |
| CEO Tenure | 735 | 11.6 | 1,401 | 10.0 | (1.5) | 3.82*** |
| Salary and Bonus Compensation | 1,656 | 606.1 | 2,576 | 982.7 | 376.7 | 12.3*** |
| Equity Compensation | 1,639 | 1,398.1 | 2,555 | 3,747.1 | 2,349.0 | 16.19*** |
| Stock Performance | 2,918 | 5.706 | 2,944 | 28.627 | 22.921 | 1.54 |
| Firm Age | 2,938 | 21.0 | 2,964 | 30.2 | 9.2 | 18.51*** |
| Size and Industry Adjusted ROA | 3,089 | (0.039) | 3,070 | 0.001 | 0.040 | 9.78*** |
| Size and Industry Adjusted Return | 2,918 | 4.2 | 2,944 | 24.3 | 20.1 | 1.37 |
| Firm Mean Compensation | 963 | 1,802.8 | 1,590 | 3,263.6 | 1,460.9 | 10.62*** |
| Executive Pay Ratio (Mean) | 952 | 2.0 | 1,575 | 2.5 | 0.5 | 3.82*** |
| Executive Pay Ratio (Median) | 950 | 2.1 | 1,570 | 2.6 | 0.6 | 4.2*** |
| Pay Gap | 1,004 | 809.0 | 1,609 | 2,984.9 | 2,175.9 | 8.51*** |
| Pay Slice | 846 | 0.260 | 1,458 | 0.296 | 0.036 | 4.38*** |
| CEO Director | 3,100 | 0.271 | 3,080 | 0.495 | 0.224 | 18.6*** |
| Firm Segments | 2,551 | 2.5 | 2,936 | 3.4 | 0.8 | 16.4*** |
| Herfindahl | 1,648 | 0.221 | 2,559 | 0.292 | 0.072 | 10.1*** |
| Executive Experience | 1,579 | 0.318 | 2,538 | 0.416 | 0.099 | 6.37*** |
| Firm Complexity | 2,538 | (0.446) | 2,926 | 0.159 | 0.605 | 41.78*** |
| Residual Compensation (With Tenure) | 444 | 389.168 | 860 | 2,165.416 | 1,776.248 | 4.61*** |
| Excess Comp (Without Tenure) | 988 | 452.028 | 1,580 | 1,954.162 | 1,502.134 | 6.81*** |

Table 4 – Multivariate Analysis of CEO Pay Ratio

Table 4 presents multivariate analysis of CEO pay ratio and tournament structure after accounting for the impact of firm and executive characteristics. Panel A presents standard tournament structure measures in the raw values, while Panel B analyzes CEO pay ratio and tournament structure after transforming the tournament structure variables. Variable definitions are included in the Appendix. Robust p-values are presented in parentheses below the coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: Analysis of Executive Pay Gap and Tournament Structure Incentives

| | (1) | (2) | (3) | (4) | (5) |
|---------------------------------|-------------------------------------|------------------------|------------------------|------------------------|------------------------|
| | Ratio of CEO to Median Employee Pay | | | | |
| Executive Pay Gap | 0.00419*** (<0.001) | | | | 0.00642*** (<0.001) |
| Median Executive Pay Ratio | | 4.676*** (0.00914) | | | 1.639 (0.920) |
| Mean Executive Pay Ratio | | | 4.360** (0.0128) | | -2.014 (0.920) |
| Executive Pay Slice | | | | 99.33*** (0.00952) | -10.27 (0.890) |
| Log (Sales) | 59.86*** (<0.001) | 61.63*** (<0.001) | 61.80*** (<0.001) | 63.53*** (<0.001) | 61.33*** (<0.001) |
| Market-to-Book Ratio | 5.015 (0.196) | 4.693 (0.247) | 4.759 (0.240) | 5.461 (0.232) | 5.527 (0.224) |
| Return-on-Assets | -103.6 (0.195) | -111.2 (0.181) | -111.1 (0.180) | -103.7 (0.261) | -106.2 (0.249) |
| Leverage | 40.03 (0.120) | 46.43* (0.0802) | 46.32* (0.0804) | 39.62 (0.181) | 34.40 (0.244) |
| CEO Director | -31.97*** (0.00671) | -23.50* (0.0552) | -22.33* (0.0658) | -38.44** (0.0100) | -37.76** (0.0113) |
| Firm Segments | -9.064*** (0.00929) | -9.281*** (0.00955) | -9.322*** (0.00912) | -10.62*** (0.00505) | -10.49*** (0.00545) |
| Herfindahl | 33.85 (0.314) | 37.05 (0.293) | 36.95 (0.293) | 33.66 (0.368) | 36.65 (0.326) |
| Executive Experience | 5.274 (0.649) | 1.816 (0.880) | 1.728 (0.886) | -0.846 (0.948) | 0.453 (0.972) |
| Observations | 2,329 | 2,243 | 2,248 | 2,050 | 2,048 |
| R-squared | 0.321 | 0.314 | 0.314 | 0.310 | 0.317 |
| Year and Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes |

Table 4 – Multivariate Analysis of CEO Pay Ratio (Continued)

Panel B: Analysis of Log Transformed Tournament Structure Measures

| | (1) | (2) | (3) | (4) | (5) |
|----------------------------------|-------------------------------------|-----------------------|------------------------|------------------------|------------------------|
| | Ratio of CEO to Median Employee Pay | | | | |
| Log (Executive Pay Gap) | 4,181*** (<0.001) | | | | 6,202*** (<0.001) |
| Log (Median Executive Pay Ratio) | | 35.20*** (0.00626) | | | -2.993 (0.966) |
| Log (Mean Executive Pay Ratio) | | | 36.04*** (0.00483) | | -5.554 (0.946) |
| Log (Executive Pay Slice) | | | | 130.3** (0.0128) | 4.001 (0.979) |
| Log (Sales) | 59.93*** (<0.001) | 61.43*** (<0.001) | 61.59*** (<0.001) | 63.57*** (<0.001) | 61.51*** (<0.001) |
| Market-to-Book Ratio | 5.038 (0.194) | 5.129 (0.205) | 5.178 (0.200) | 5.477 (0.230) | 5.542 (0.223) |
| Return-on-Assets | -104.0 (0.194) | -112.5 (0.175) | -113.4 (0.171) | -104.1 (0.260) | -106.0 (0.250) |
| Leverage | 39.98 (0.120) | 44.83* (0.0913) | 44.46* (0.0935) | 39.78 (0.179) | 34.75 (0.240) |
| CEO Director | -31.80*** (0.00694) | -33.42** (0.0145) | -33.56** (0.0133) | -38.22** (0.0112) | -35.95** (0.0171) |
| Firm Segments | -9.060*** (0.00932) | -9.184** (0.0103) | -9.233*** (0.00978) | -10.59*** (0.00519) | -10.52*** (0.00536) |
| Herfindahl | 33.94 (0.313) | 39.70 (0.259) | 40.07 (0.254) | 33.96 (0.364) | 36.15 (0.333) |
| Executive Experience | 5.337 (0.645) | 3.809 (0.752) | 3.797 (0.752) | -0.657 (0.960) | 0.237 (0.985) |
| Observations | 2,329 | 2,243 | 2,248 | 2,050 | 2,048 |
| R-squared | 0.321 | 0.315 | 0.315 | 0.310 | 0.316 |
| Year and Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes |

Table 5 – Hierarchical Pay and Performance

Table 5 presents multivariate analysis of CEO pay ratio and executive pay gap on firm performance and efficiency. Variable definitions are included in the Appendix. Robust p-values are presented in parentheses below the coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

| | (1) Return-on- Assets | (2) Profit Margin | (3) Total Asset Turnover | (4) Equity Multiplier | (5) Buy and Hold Abnormal Return |
|---------------------------------|-----------------------------|-------------------------|--------------------------------|-----------------------------|--|
| High Ratio * High Gap | 0.0221*** (0.00422) | 0.0642* (0.0856) | 0.0955** (0.0429) | 5.309** (0.0383) | 11.17* (0.0845) |
| High Executive Pay Gap | 0.00630 (0.491) | 0.102** (0.0441) | 0.0815** (0.0444) | -3.915 (0.113) | -9.528** (0.0493) |
| High CEO Pay Ratio | 0.0104* (0.0687) | 0.0457* (0.0662) | -0.00430 (0.903) | -5.949*** (0.00196) | -9.604 (0.124) |
| Tournament Incentives | 0.00266* (0.0695) | 0.0103* (0.0563) | 0.00851 (0.469) | 0.181 (0.748) | -0.597 (0.791) |
| Log (Total Compensation) | -0.00646** (0.0279) | -0.0367* (0.0515) | -0.0813*** (<0.001) | -0.0659 (0.938) | 2.224 (0.108) |
| Log (Sales) | 0.00769*** (<0.001) | 0.0373** (0.0104) | 0.0578*** (<0.001) | 1.516*** (0.00949) | -0.381 (0.796) |
| Market-to-Book Ratio | 0.0150*** (<0.001) | -0.0587*** (0.00294) | 0.0456*** (<0.001) | -0.381 (0.381) | 0.189 (0.858) |
| Return-on-Assets | 0.419*** (<0.001) | 3.676*** (<0.001) | 0.778*** (<0.001) | -12.68 (0.146) | -0.750 (0.972) |
| Leverage | 0.00870 (0.268) | -0.133** (0.0480) | -0.0700 (0.440) | -5.612** (0.0485) | -4.968 (0.471) |
| CEO Director | -0.000444 (0.916) | 0.00891 (0.617) | 0.0156 (0.567) | 2.223 (0.128) | -0.777 (0.830) |
| Firm Segments | -0.000571 (0.458) | -0.00518* (0.0997) | -0.0191*** (0.00546) | 0.375 (0.298) | -0.283 (0.757) |
| Herfindahl | 0.00544 (0.533) | 0.0245 (0.632) | 0.0908 (0.180) | 4.618 (0.197) | -4.292 (0.623) |
| Executive Experience | 0.000261 (0.944) | 0.0463* (0.0670) | -0.0790*** (<0.001) | 0.744 (0.547) | -0.159 (0.959) |
| Observations | 1,775 | 1,971 | 1,971 | 1,977 | 1,786 |
| R-squared | 0.393 | 0.377 | 0.590 | 0.046 | 0.019 |
| Year and Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes |

Table 6 – Employee Pay, Performance and Hierarchical Pay

Table 6 presents multivariate analysis of CEO pay ratio and executive pay gap on firm accounting performance and profitability by whether or not the firm has above or below median compensation for the firm's median employee. Variable definitions are included in the Appendix. Robust p-values are presented in parentheses below the coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

| Median Employee Pay Subsample: | (1) | (2) | (3) | (4) | (5) | (6) |
|-----------------------------------|--------------------------|-------------------------|--------------------------|-------------------------|------------------------|---------------------------|
| | Return-On-Assets High | Return-On-Assets Low | Return-On-Equity High | Return-On-Equity Low | Profit Margin High | Profit Margin Low |
| High Ratio * High Gap | 0.0277** (0.0226) | 0.00484 (0.621) | 0.253* (0.0906) | 0.130 (0.401) | 0.0846* (0.0901) | -0.00616 (0.413) |
| High Pay Gap | 0.0158 (0.188) | -0.0204 (0.222) | 0.0575 (0.625) | -0.0522 (0.776) | 0.0694 (0.261) | -0.0149 (0.109) |
| High CEO Pay Ratio | 0.0154* (0.0738) | -0.00327 (0.679) | 0.0413 (0.721) | -0.228 (0.386) | 0.0312 (0.332) | 0.00197 (0.766) |
| Tournament Incentives | 0.00397 (0.128) | 0.00197 (0.235) | 0.0601 (0.310) | -0.00485 (0.912) | 0.0225 (0.101) | 0.000373 (0.801) |
| Log (Total Comp) | -0.00856* (0.0950) | -0.00151 (0.589) | -0.0482 (0.334) | -0.0603 (0.311) | -0.0566** (0.0215) | 0.000764 (0.809) |
| Log (Sales) | 0.0116*** (<0.001) | 0.00310 (0.131) | 0.0219 (0.691) | 0.116 (0.172) | 0.0681*** (0.00717) | -0.000573 (0.977) |
| Market-to-Book Ratio | 0.0131*** (<0.001) | 0.0178*** (<0.001) | -0.0679 (0.134) | 0.00916 (0.864) | -0.0611** (0.0224) | -0.00935*** (0.000921) |
| Return-on-Assets | 0.391*** (<0.001) | 0.416*** (<0.001) | 5.077** (0.0307) | -0.0970 (0.971) | 4.620*** (<0.001) | 1.071*** (<0.001) |
| Leverage | 0.00127 (0.944) | 0.00248 (0.779) | -0.989** (0.0218) | -0.981 (0.212) | -0.387** (0.0377) | -0.00705 (0.600) |
| CEO Director | -0.00138 (0.836) | -0.00218 (0.688) | -0.142 (0.246) | 0.0610 (0.644) | -0.0673* (0.0908) | 0.00517 (0.317) |
| Firm Segments | -0.00154 (0.237) | -0.000722 (0.466) | -0.0100 (0.514) | 0.0579 (0.272) | -0.0102 (0.119) | 0.00127 (0.220) |
| Herfindahl | 0.00993 (0.552) | 0.000396 (0.969) | -0.128 (0.718) | 0.485* (0.0927) | 0.111 (0.404) | -0.0103 (0.258) |
| Executive Experience | -0.00114 (0.851) | 0.000628 (0.886) | 0.0677 (0.458) | -0.272 (0.272) | 0.0549 (0.169) | 0.00239 (0.547) |
| Observations | 929 | 845 | 1,004 | 972 | 1,004 | 972 |
| R-squared | 0.375 | 0.521 | 0.332 | 0.039 | 0.454 | 0.648 |

Table 7 – Employee Pay, Investments and Hierarchical Pay

Table 7 presents multivariate analysis of CEO pay ratio and executive pay gap on firm investments and expenses by whether or not the firm has above or below median compensation for the firm’s median employee. Variable definitions are included in the Appendix. Robust p-values are presented in parentheses below the coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

| Median Employee Pay Subsample: | (1) | (2) | (3) | (4) | (5) | (6) |
|-----------------------------------|--------------------------|-------------------------|------------------------|-------------------------|-------------------------|-------------------------|
| | Research and Development | | Acquisitions | | SG&A Expenses | |
| | High | Low | High | Low | High | Low |
| High Ratio * High Gap | -0.00610 (0.546) | -0.0121* (0.0655) | 0.0155* (0.0725) | -0.00684 (0.493) | -0.00758 (0.630) | 0.0556** (0.0432) |
| High Pay Gap | 0.00205 (0.844) | -0.00758 (0.469) | 0.00921 (0.113) | -0.00621 (0.594) | -0.0159 (0.296) | 0.0654 (0.105) |
| High CEO Pay Ratio | -0.00271 (0.758) | -0.00814 (0.150) | 0.0170** (0.0121) | -0.0101 (0.279) | -0.00438 (0.747) | 0.00374 (0.861) |
| Tournament Incentives | 0.000821 (0.771) | -0.000645 (0.402) | -0.000170 (0.934) | 0.00122 (0.644) | -0.000480 (0.901) | -0.00660 (0.113) |
| Log (Total Comp) | 0.00119 (0.683) | 0.000773 (0.615) | 0.00233 (0.320) | 0.00361 (0.258) | -0.00220 (0.683) | -0.0334*** (0.00910) |
| Log (Sales) | -0.00277 (0.265) | -0.00114 (0.454) | -0.00337 (0.138) | -0.00198 (0.350) | -0.0165*** (<0.001) | -0.0161** (0.0165) |
| Market-to-Book Ratio | 0.0202*** (<0.001) | 0.00716*** (0.00117) | -0.0000576 (0.971) | -0.00792*** (<0.001) | 0.0389*** (<0.001) | 0.0401*** (<0.001) |
| Return-on-Assets | -0.277*** (<0.001) | -0.0701* (0.0617) | -0.00896 (0.785) | 0.0341 (0.353) | -0.370*** (<0.001) | -0.0487 (0.747) |
| Leverage | -0.0588*** (0.00169) | -0.0250*** (0.00152) | 0.0344*** (0.00358) | 0.0462*** (<0.001) | -0.121*** (0.000169) | -0.0671* (0.0541) |
| CEO Director | 0.00139 (0.838) | 0.00586** (0.0366) | -0.000996 (0.812) | -0.00991* (0.0573) | 0.00557 (0.580) | 0.00225 (0.871) |
| Firm Segments | -0.00317** (0.0161) | -0.0000244 (0.974) | 0.000797 (0.429) | -0.00109 (0.368) | -0.00255 (0.224) | -0.00302 (0.264) |
| Herfindahl | -0.0349** (0.0243) | -0.000699 (0.908) | -0.000651 (0.966) | 0.0153 (0.364) | 0.0402 (0.191) | 0.0113 (0.761) |
| Executive Experience | 0.00328 (0.575) | 0.00338 (0.120) | 0.00000439 (0.999) | -0.000930 (0.849) | 0.00212 (0.791) | 0.00581 (0.607) |
| Observations | 506 | 604 | 935 | 902 | 760 | 903 |
| R-squared | 0.628 | 0.441 | 0.120 | 0.143 | 0.642 | 0.471 |

Table 8 – CEO Pay Ratio, Excess Compensation, and Tournament Structure

Table 8 presents multivariate analysis of CEO pay ratio and residual compensation before and after accounting for the role of tournament structure and the impact of firm and executive characteristics. Variable definitions are included in the Appendix. Robust p-values are presented in parentheses below the coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

| | (1) | (2) | (3) | (4) | (5) |
|-------------------------------------|-------------------------------------|------------------------|------------------------|------------------------|------------------------|
| | Ratio of CEO to Median Employee Pay | | | | |
| Excess Compensation | 0.00478*** (<0.001) | | 0.00220* (0.0958) | | 0.00588 (0.636) |
| Residual Compensation (With Tenure) | | 0.00398*** (<0.001) | | 0.0000672 (0.963) | -0.00845 (0.484) |
| Executive Pay Gap | | | | | 0.00306* (0.0856) |
| Log (Total Compensation) | | | 27.76*** (0.00138) | 49.36*** (<0.001) | 52.89*** (<0.001) |
| Tournament Incentives | | | | | -0.854 (0.909) |
| Log (Sales) | 60.99*** (<0.001) | 63.93*** (<0.001) | 51.71*** (<0.001) | 47.38*** (<0.001) | 41.30*** (<0.001) |
| Market-to-Book Ratio | 4.951 (0.209) | -5.030 (0.433) | 3.878 (0.325) | -4.860 (0.445) | -4.011 (0.599) |
| Return-on-Assets | -99.97 (0.222) | 157.1 (0.211) | -92.95 (0.255) | 134.4 (0.282) | 151.7 (0.323) |
| Leverage | 44.39* (0.0890) | 28.22 (0.396) | 40.65 (0.119) | 21.75 (0.510) | 6.865 (0.859) |
| CEO Director | -27.46** (0.0246) | -87.54* (0.0632) | -39.69*** (0.00190) | -105.2** (0.0251) | -131.8** (0.0230) |
| Firm Segments | -9.042** (0.0105) | -12.28** (0.0115) | -9.203*** (0.00907) | -12.93*** (0.00740) | -15.88*** (0.00299) |
| Herfindahl | 37.15 (0.274) | 76.65 (0.107) | 43.78 (0.197) | 97.39** (0.0404) | 110.6** (0.0419) |
| Executive Experience | 7.791 (0.509) | -1.333 (0.935) | 8.987 (0.446) | -3.240 (0.841) | -4.322 (0.817) |
| Observations | 2,297 | 1,169 | 2,297 | 1,169 | 1,000 |
| R-squared | 0.318 | 0.359 | 0.321 | 0.369 | 0.380 |
| Year and Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes |

Table 9 – CEO Pay Ratio, Pay Gap, Tournament Incentives and Components

Table 9 presents multivariate analysis of CEO pay ratio and tournament structure after performing principal component analysis and accounting for the primary principal component and impact of firm and executive characteristics. Panel A presents standard tournament structure measures in the raw values, while Panel B analyzes CEO pay ratio and tournament structure after transforming the tournament structure variables. Panel C presents multivariate analysis of CEO pay ratio and tournament structure after considering the level of total compensation and median employee compensation (Panel D) and performing principal component analysis and accounting for the primary principal component. Variable definitions are included in the Appendix. Robust p-values are presented in parentheses below the coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

| | (1) | (2) | (3) | (4) | (5) |
|---------------------------------|-------------------------------------|------------------------|------------------------|------------------------|------------------------|
| | Ratio of CEO to Median Employee Pay | | | | |
| Executive Pay Gap | 0.00448*** (<0.001) | | | | 0.00631*** (<0.001) |
| Median Executive Pay Ratio | | 5.866*** (0.00473) | | | -0.664 (0.967) |
| Mean Executive Pay Ratio | | | 5.776*** (0.00649) | | 5.752 (0.773) |
| Executive Pay Slice | | | | 104.8** (0.0158) | -39.98 (0.599) |
| Tournament Incentives | -2.176 (0.701) | 0.275 (0.961) | 0.541 (0.924) | -3.757 (0.550) | -4.950 (0.430) |
| Log (Sales) | 62.12*** (<0.001) | 63.97*** (<0.001) | 64.03*** (<0.001) | 63.70*** (<0.001) | 61.52*** (<0.001) |
| Market-to-Book Ratio | 6.076 (0.179) | 5.480 (0.227) | 5.496 (0.226) | 5.851 (0.200) | 5.833 (0.199) |
| Return-on-Assets | -95.81 (0.294) | -95.30 (0.298) | -94.44 (0.303) | -97.26 (0.292) | -100.7 (0.273) |
| Leverage | 27.54 (0.343) | 33.42 (0.251) | 33.52 (0.250) | 33.58 (0.259) | 27.93 (0.346) |
| CEO Director | -32.37** (0.0134) | -25.33* (0.0529) | -24.78* (0.0580) | -37.38** (0.0151) | -36.65** (0.0167) |
| Firm Segments | -10.75*** (0.00428) | -10.97*** (0.00368) | -10.99*** (0.00362) | -10.76*** (0.00464) | -10.62*** (0.00500) |
| Herfindahl | 47.12 (0.204) | 47.10 (0.205) | 47.11 (0.205) | 42.00 (0.263) | 45.08 (0.228) |
| Executive Experience | -4.711 (0.713) | -7.350 (0.567) | -7.331 (0.568) | -6.574 (0.613) | -5.206 (0.688) |
| Observations | 2,023 | 2,023 | 2,023 | 1,992 | 1,992 |
| R-squared | 0.321 | 0.317 | 0.316 | 0.312 | 0.319 |
| Year and Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes |

Table 9 – CEO Pay Ratio, Pay Gap, Tournament Incentives and Components (Continued)

Panel B: Principal Component Analysis and Log Transformed Tournament Measures

| | (1) | (2) | (3) | (4) | (5) |
|----------------------------------|-------------------------------------|------------------------|------------------------|------------------------|------------------------|
| | Ratio of CEO to Median Employee Pay | | | | |
| Log (Executive Pay Gap) | 4,463*** (<0.001) | | | | 6,095*** (<0.001) |
| Log (Median Executive Pay Ratio) | | 47.72*** (0.00309) | | | 0.212 (0.998) |
| Log (Mean Executive Pay Ratio) | | | 50.21*** (0.00230) | | 14.74 (0.858) |
| Log (Executive Pay Slice) | | | | 133.2** (0.0242) | -59.33 (0.701) |
| Tournament Incentives | -2.167 (0.702) | -3.721 (0.542) | -3.970 (0.515) | -3.186 (0.611) | -4.179 (0.505) |
| Log (Sales) | 62.21*** (<0.001) | 63.82*** (<0.001) | 63.89*** (<0.001) | 63.72*** (<0.001) | 61.68*** (<0.001) |
| Market-to-Book Ratio | 6.109 (0.176) | 6.110 (0.178) | 6.114 (0.177) | 5.862 (0.199) | 5.920 (0.193) |
| Return-on-Assets | -96.31 (0.291) | -98.80 (0.281) | -98.18 (0.284) | -97.69 (0.290) | -100.9 (0.272) |
| Leverage | 27.50 (0.344) | 31.82 (0.275) | 31.75 (0.276) | 33.68 (0.257) | 27.75 (0.349) |
| CEO Director | -32.14** (0.0139) | -39.10*** (0.00885) | -40.14*** (0.00741) | -36.57** (0.0185) | -34.52** (0.0260) |
| Firm Segments | -10.75*** (0.00428) | -10.83*** (0.00414) | -10.88*** (0.00396) | -10.72*** (0.00481) | -10.60*** (0.00511) |
| Herfindahl | 47.23 (0.202) | 49.40 (0.184) | 50.12 (0.177) | 42.46 (0.258) | 45.30 (0.226) |
| Executive Experience | -4.648 (0.717) | -4.651 (0.718) | -4.452 (0.729) | -6.447 (0.620) | -5.110 (0.693) |
| Observations | 2,023 | 2,023 | 2,023 | 1,992 | 1,992 |
| R-squared | 0.321 | 0.317 | 0.317 | 0.312 | 0.319 |
| Year and Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes |

Table 9 – CEO Pay Ratio, Pay Gap, Tournament Incentives and Components (Continued)

Panel C: Pay Gap, Tournament Structure and Median Employee Pay

| | (1) | (2) | (3) | (4) | (5) |
|---------------------------------|-------------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| | Ratio of CEO to Median Employee Pay | | | | |
| Executive Pay Gap | 0.00479*** (<0.001) | | | | 0.00515*** (<0.001) |
| Executive Pay Ratio (Median) | | 7.650*** (<0.001) | | | 1.113 (0.943) |
| Executive Pay Ratio (Mean) | | | 7.694*** (<0.001) | | -0.597 (0.975) |
| Executive Pay Slice | | | | 145.5*** (<0.001) | 51.48 (0.482) |
| Median Employee Pay | -0.00193*** (<0.001) | -0.00195*** (<0.001) | -0.00195*** (<0.001) | -0.00194*** (<0.001) | -0.00191*** (<0.001) |
| Tournament Incentives | -1.518 (0.781) | 0.440 (0.936) | 0.685 (0.900) | -5.914 (0.326) | -6.937 (0.250) |
| Log (Sales) | 61.46*** (<0.001) | 63.50*** (<0.001) | 63.59*** (<0.001) | 63.74*** (<0.001) | 61.90*** (<0.001) |
| Market-to-Book Ratio | 16.68*** (<0.001) | 15.93*** (<0.001) | 15.94*** (<0.001) | 16.81*** (<0.001) | 16.54*** (<0.001) |
| Return-on-Assets | -258.7*** (0.00357) | -259.5*** (0.00357) | -258.6*** (0.00369) | -265.6*** (0.00310) | -262.8*** (0.00335) |
| Leverage | 13.82 (0.621) | 19.98 (0.476) | 20.15 (0.472) | 17.93 (0.530) | 14.21 (0.618) |
| CEO Director | -28.41** (0.0237) | -23.73* (0.0593) | -23.17* (0.0651) | -40.63*** (0.00519) | -39.60*** (0.00630) |
| Firm Segments | -12.27*** (<0.001) | -12.49*** (<0.001) | -12.51*** (<0.001) | -12.44*** (<0.001) | -12.30*** (<0.001) |
| Herfindahl | 38.52 (0.281) | 37.27 (0.298) | 37.32 (0.297) | 32.14 (0.373) | 34.59 (0.336) |
| Executive Experience | 3.077 (0.803) | 0.166 (0.989) | 0.115 (0.993) | 0.580 (0.963) | 2.399 (0.848) |
| Observations | 2,026 | 2,026 | 2,026 | 1,992 | 1,992 |
| R-squared | 0.371 | 0.367 | 0.367 | 0.364 | 0.369 |
| Year and Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes |

Table 9 – CEO Pay Ratio, Pay Gap, Tournament Incentives and Components (Continued)

Panel D: Pay Gap, Tournament Structure and CEO Pay

| | (1) | (2) | (3) | (4) | (5) |
|--|-------------------------------------|------------------------|------------------------|------------------------|------------------------|
| | Ratio of CEO to Median Employee Pay | | | | |
| Executive Pay Gap | 0.00306*** (0.00540) | | | | 0.00521*** (<0.001) |
| Executive Pay Ratio (Median) | | 2.573 (0.259) | | | -6.160 (0.702) |
| Executive Pay Ratio (Mean) | | | 2.472 (0.290) | | 6.692 (0.735) |
| Executive Pay Slice | | | | 31.06 (0.559) | -38.41 (0.630) |
| Log (Total Compensation) | 26.51*** (0.00232) | 33.98*** (<0.001) | 34.34*** (<0.001) | 34.40*** (<0.001) | 27.20*** (0.00721) |
| Tournament Structure Principal Component | -5.526 (0.335) | -4.120 (0.473) | -4.032 (0.482) | -5.760 (0.358) | -7.003 (0.264) |
| Log (Sales) | 52.72*** (<0.001) | 51.30*** (<0.001) | 51.19*** (<0.001) | 51.19*** (<0.001) | 51.83*** (<0.001) |
| Market-to-Book Ratio | 5.058 (0.265) | 4.360 (0.337) | 4.357 (0.337) | 4.542 (0.323) | 4.870 (0.288) |
| Return-on-Assets | -79.45 (0.383) | -77.16 (0.398) | -76.79 (0.400) | -86.78 (0.346) | -87.89 (0.339) |
| Leverage | 20.17 (0.488) | 23.15 (0.426) | 23.16 (0.426) | 23.40 (0.431) | 21.07 (0.477) |
| CEO Director | -37.60*** (0.00681) | -36.56*** (0.00872) | -36.47*** (0.00889) | -38.01** (0.0119) | -36.13** (0.0166) |
| Firm Segments | -10.76*** (0.00421) | -10.92*** (0.00372) | -10.93*** (0.00370) | -10.78*** (0.00444) | -10.67*** (0.00478) |
| Herfindahl | 54.45 (0.143) | 56.09 (0.132) | 56.23 (0.131) | 53.21 (0.156) | 53.59 (0.152) |
| Executive Experience | 2.079 (0.871) | 0.620 (0.961) | 0.624 (0.961) | -0.639 (0.961) | 1.418 (0.913) |
| Observations | 2,027 | 2,027 | 2,027 | 1,993 | 1,993 |
| R-squared | 0.321 | 0.319 | 0.319 | 0.316 | 0.320 |
| Year and Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes |

Table 10 – Expanded Analysis of Executive to Average Employee Pay Ratio

Table 10 presents multivariate analysis of CEO pay ratio and tournament structure after accounting for the average wages of employees using alternative data definitions to expand the sample. Panel A employs the mean employee wage when the median employee pay is unavailable and presents standard tournament structure measures in the raw values, while Panel B analyzes CEO pay ratio and tournament structure after employing firm fixed effects, which become feasible given the expanded sample. Variable definitions are included in the Appendix. Robust p-values are presented in parentheses below the coefficients. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

Panel A: Analysis of Executive Pay Gap and Average Employee Pay

| | (1) | (2) | (3) | (4) | (5) |
|---------------------------------|--------------------------------------|----------------------|----------------------|----------------------|------------------------|
| | Ratio of CEO to Average Employee Pay | | | | |
| Executive Pay Gap | 0.00914*** (<0.001) | | | | 0.00922*** (<0.001) |
| Median Executive Pay Ratio | | 15.77*** (<0.001) | | | -3.743 (0.277) |
| Mean Executive Pay Ratio | | | 13.29*** (<0.001) | | 19.23*** (<0.001) |
| Executive Pay Slice | | | | 221.1*** (<0.001) | -230.8*** (<0.001) |
| Log (Sales) | 12.75*** (<0.001) | 24.89*** (<0.001) | 25.06*** (<0.001) | 24.33*** (<0.001) | 13.28*** (<0.001) |
| Market-to-Book Ratio | 3.796* (0.060) | 6.445*** (0.003) | 6.497*** (0.0030) | 6.792*** (0.0030) | 3.813* (0.090) |
| Return-on-Assets | -12.50 (0.589) | -16.95 (0.499) | -13.78 (0.584) | -29.76 (0.320) | -20.24 (0.490) |
| Leverage | 69.81*** (<0.001) | 65.87*** (<0.001) | 68.23*** (<0.001) | 71.20*** (<0.001) | 69.91*** (<0.001) |
| CEO Director | -12.84 (0.372) | -14.89 (0.327) | -14.38 (0.344) | -23.79 (0.141) | -9.620 (0.545) |
| Firm Segments | -4.768*** (0.003) | -4.533*** (0.008) | -4.466*** (0.009) | -4.576*** (0.009) | -4.823*** (0.005) |
| Herfindahl | 23.09 (0.177) | 15.04 (0.404) | 15.53 (0.389) | 11.30 (0.547) | 14.88 (0.418) |
| Executive Experience | 5.785 (0.408) | 7.454 (0.308) | 8.631 (0.239) | 7.206 (0.343) | 4.994 (0.502) |
| Observations | 5,476 | 5,288 | 5,297 | 5,050 | 5,042 |
| R-squared | 0.372 | 0.352 | 0.347 | 0.349 | 0.378 |
| Year and Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes |

Table 10 – Expanded Analysis of Executive to Average Employee Pay Ratio (Continued)

Panel B: Analysis of Within Firm Variation

| | (1) | (2) | (3) | (4) | (5) |
|-----------------------------|--------------------------------------|----------------------|----------------------|----------------------|------------------------|
| | Ratio of CEO to Average Employee Pay | | | | |
| Executive Pay Gap | 0.00480*** (<0.001) | | | | 0.00516*** (<0.001) |
| Median Executive Pay Ratio | | 8.427*** (<0.001) | | | -3.126 (0.175) |
| Mean Executive Pay Ratio | | | 5.411*** (<0.001) | | 15.15*** (<0.001) |
| Executive Pay Slice | | | | 94.54*** (<0.001) | -203.6*** (<0.001) |
| Log (Sales) | -13.50*** (0.008) | -10.51* (0.053) | -9.393* (0.084) | -9.734* (0.087) | -12.67** (0.023) |
| Market-to-Book Ratio | 8.360*** (<0.001) | 9.074*** (<0.001) | 9.148*** (<0.001) | 9.603*** (<0.001) | 8.687*** (<0.001) |
| Return-on-Assets | 5.208 (0.779) | 11.28 (0.583) | 16.22 (0.429) | 9.269 (0.661) | 1.474 (0.944) |
| Leverage | 131.1*** (<0.001) | 136.5*** (<0.001) | 138.5*** (<0.001) | 145.9*** (<0.001) | 139.6*** (<0.001) |
| CEO Director | 8.779 (0.428) | 9.393 (0.419) | 10.72 (0.357) | 9.289 (0.446) | 15.21 (0.204) |
| Firm Segments | 0.741 (0.671) | 0.352 (0.848) | 0.00503 (0.998) | -0.0198 (0.992) | 0.360 (0.846) |
| Herfindahl | 25.85 (0.281) | 29.45 (0.241) | 27.38 (0.277) | 30.80 (0.237) | 26.49 (0.300) |
| Executive Experience | -5.601 (0.425) | -5.389 (0.463) | -4.160 (0.572) | -4.225 (0.580) | -6.091 (0.416) |
| Observations | 5,476 | 5,288 | 5,297 | 5,050 | 5,042 |
| R-squared | 0.179 | 0.159 | 0.152 | 0.155 | 0.191 |
| Year and Firm Fixed Effects | Yes | Yes | Yes | Yes | Yes |

Table 10 – Expanded Analysis of Executive to Average Employee Pay Ratio (Continued)

Panel C: Analysis of Minimum Executive Compensation Pay Ratio

| | (1) | (2) | (3) | (4) | (5) |
|---------------------------------|--|-------------------------|-------------------------|------------------------|-------------------------|
| | Ratio of Minimum Executive to Average Employee Pay | | | | |
| Executive Pay Gap | 0.0000009*** (<0.001) | | | | 0.000002*** (<0.001) |
| Median Executive Pay Ratio | | -0.000825** (0.0162) | | | -0.00252*** (0.003) |
| Mean Executive Pay Ratio | | | -0.000771** (0.0254) | | 0.0007 (0.564) |
| Executive Pay Slice | | | | -0.0150** (0.0205) | -0.0411*** (<0.001) |
| Log (Sales) | 0.0119*** (<0.001) | 0.0130*** (<0.001) | 0.0130*** (<0.001) | 0.0133*** (<0.001) | 0.0109*** (<0.001) |
| Market-to-Book Ratio | 0.00243*** (<0.001) | 0.00264*** (<0.001) | 0.00266*** (<0.001) | 0.00271*** (<0.001) | 0.00220*** (<0.001) |
| Return-on-Assets | -0.00242 (0.692) | -0.00188 (0.760) | -0.00225 (0.714) | -0.00402 (0.583) | -0.00192 (0.791) |
| Leverage | 0.00464 (0.168) | 0.00555 (0.102) | 0.00535 (0.115) | 0.00528 (0.137) | 0.00609* (0.0837) |
| CEO Director | -0.00686* (0.0636) | -0.00695* (0.0620) | -0.00682* (0.0661) | -0.00774* (0.0501) | -0.00678* (0.0841) |
| Firm Segments | -0.000230 (0.579) | -0.000136 (0.743) | -0.000166 (0.690) | -0.000195 (0.649) | -0.000244 (0.565) |
| Herfindahl | -0.00283 (0.519) | -0.00382 (0.387) | -0.00380 (0.389) | -0.00443 (0.335) | -0.00353 (0.438) |
| Executive Experience | -0.00177 (0.322) | -0.00137 (0.446) | -0.00135 (0.451) | -0.00176 (0.343) | -0.00202 (0.273) |
| Observations | 5,296 | 5,285 | 5,294 | 5,047 | 5,039 |
| R-squared | 0.355 | 0.350 | 0.350 | 0.353 | 0.366 |
| Year and Industry Fixed Effects | Yes | Yes | Yes | Yes | Yes |

Table 10 – Expanded Analysis of Executive to Average Employee Pay Ratio (Continued)

Panel D: Analysis of Within Firm Variation in Minimum Executive Compensation Pay Ratio

| | (1) | (2) | (3) | (4) | (5) |
|-----------------------------|--|-------------------------|--------------------------|------------------------|--------------------------|
| | Ratio of Minimum Executive to Average Employee Pay | | | | |
| Executive Pay Gap | 0.0000006*** (<0.001) | | | | 0.0000014*** (<0.001) |
| Median Executive Pay Ratio | | -0.00102*** (<0.001) | | | -0.00161*** (0.00690) |
| Mean Executive Pay Ratio | | | -0.000964*** (<0.001) | | 0.000119 (0.894) |
| Executive Pay Slice | | | | -0.0291*** (<0.001) | -0.0519*** (<0.001) |
| Log (Sales) | 0.00433*** (0.002) | 0.00487*** (<0.001) | 0.00472*** (<0.001) | 0.00450*** (0.002) | 0.00379*** (0.009) |
| Market-to-Book Ratio | 0.00155*** (0.008) | 0.00162*** (0.006) | 0.00164*** (0.005) | 0.00164*** (0.007) | 0.00148** (0.014) |
| Return-on-Assets | 0.000690 (0.896) | 0.00276 (0.603) | 0.00195 (0.712) | 0.00367 (0.501) | 0.00184 (0.732) |
| Leverage | -0.0125*** (0.005) | -0.0115*** (0.009) | -0.0116*** (0.009) | -0.0123*** (0.007) | -0.0133*** (0.003) |
| CEO Director | 0.000537 (0.858) | 0.00102 (0.734) | 0.00104 (0.729) | 0.00284 (0.366) | 0.00270 (0.383) |
| Firm Segments | 0.00173*** (<0.001) | 0.00161*** (<0.001) | 0.00160*** (<0.001) | 0.00154*** (0.002) | 0.00166*** (<0.001) |
| Herfindahl | 0.0128** (0.0491) | 0.0117* (0.0732) | 0.0118* (0.0690) | 0.0106 (0.116) | 0.00972 (0.142) |
| Executive Experience | -0.0006 (0.746) | -0.0003 (0.866) | -0.0004 (0.838) | -0.0004 (0.829) | -0.0006 (0.754) |
| Observations | 5,296 | 5,285 | 5,294 | 5,047 | 5,039 |
| R-squared | 0.045 | 0.041 | 0.040 | 0.046 | 0.078 |
| Year and Firm Fixed Effects | Yes | Yes | Yes | Yes | Yes |

Appendix: Variable Definitions

| Variable | Measurement | Data Source |
|---|--|------------------|
| BHAR | Buy and hold annual return calculated following Lyon, Barber, & Tsai (1999) such that each firm's return is adjusted using the relevant portfolio return according to 14 size reference portfolios and 10 book-to-market ratio reference portfolios for 24 and 36 months, where portfolio mean returns are computed monthly and compounded over the relevant time period. Firm market value of equity (i.e., size) is computed in June of each year to rank firms into NYSE deciles, the smallest of which is further divided into quintiles since approximately half of firms fall into the smallest decile. Book-to-market ratio is computed by taking the book value of equity from the prior period balance sheet year end and classified according to NYSE decile portfolios. | CRSP |
| Book-to-Market Ratio | The ratio of the book value of equity to the market capitalization | Compustat Annual |
| Cash compensation | The sum of salary and bonus compensation the CEO receives in thousands of dollars | ExecuComp |
| CEO Director | Binary equal to 1 if the CEO also serves on the board of directors | ExecuComp |
| Equity compensation | The total value of the CEO's equity compensation for the year | ExecuComp |
| Excess Compensation | The residual from Core et al. (2008) model for expected compensation, using total compensation without tenure included in the model to enlarge sample size | ExecuComp |
| Executive Pay Gap | Dollar difference between the pay of the CEO and that of the firm's next three highest paid executives, listed in thousands of dollars | ExecuComp |
| Executive Pay Ratio (Mean) | Ratio of the CEO's pay to the mean pay of the next four highest paid executives | ExecuComp |
| Executive Pay Ratio (Median) | Ratio of the CEO's pay to the median pay of the next four highest paid executives | ExecuComp |
| Executive Pay Slice | Percentage of the top five highest paid executive's compensation that the CEO receives | ExecuComp |
| Firm age | The length of time the firm has been listed as a publicly traded firm | CRSP |
| Herfindahl (HHI industry concentration) | The Herfindahl Hirschman Index (HHI) is the sum of the squares of the sales-based market share percentages of all the firms in an industry that have sales data on Compustat. | Compustat Annual |
| Leverage | The ratio of the firm's book value of debt to assets | Compustat Annual |
| Log (Executive Pay Gap) | Log of 1,000,000 plus the dollar difference between the pay of the CEO and the average of the firm's next three highest paid executives | ExecuComp |
| Market-to-Book Ratio | The ratio of the market value of assets (i.e., the sum of market capitalization and debt) to the book value of total assets | Compustat Annual |
| Market capitalization | The product of shares outstanding and stock price listed in thousands of USD | Compustat Annual |
| Median Employee Pay | The firm's median employee compensation | Equillar |
| CEO Pay Ratio | Ratio between the pay of the CEO and that of the firm's median employee | Equillar |
| Prior Executive Experience | Binary equal to 1 when the newly appointed CEO has prior CEO experience | ExecuComp |
| R&D ratio | The ratio of firm research and development expenses to sales | Compustat Annual |
| Residual Compensation | The residual from Core et al. (2008) model for expected compensation, using total compensation | ExecuComp |
| Return-on-assets (ROA) | The ratio of EBITDA to total assets | Compustat Annual |
| Sales | Firm sales, in millions of USD | Compustat Annual |
| Segments | The number of firm geographic and business segments | Compustat Annual |
| Tenure | The CEO's tenure at the current firm | ExecuComp |
| Tournament Incentives | The first factor from the principal component analysis of all four tournament incentive measures (i.e., pay gap, pay slice, median pay ratio and mean pay ratio). | ExecuComp |
| Total compensation (TDC1) | Total compensation paid to the new or departing CEO in thousands of dollars (TDC1) | ExecuComp |