7-2017

Do high CEO pay ratios destroy firm value?

Qiang CHENG
Singapore Management University, qcheng@smu.edu.sg

Tharindra RANASINGHE
University of Maryland at College Park

Sha ZHAO
Oakland University

Do High CEO Pay Ratios Destroy Firm Value? [*]

Qiang Cheng
Singapore Management University

Tharindra Ranasinghe
University of Maryland

Sha Zhao
Oakland University

July 2017

Abstract

There is growing public concern over the rapid growth in CEO pay relative to average worker pay (CEO pay ratio). Critics contend that high CEO pay ratios could destroy firm value by damaging employee morale and/or signal CEO rent extraction. In this paper, we use a proprietary dataset to examine the relationship between CEO pay ratio and firm value/performance. Contrary to critics' arguments, we find that industry-adjusted CEO pay ratios are positively associated with both firm value and performance. We also find that high CEO pay ratios are associated with higher quality acquisitions and stronger CEO turnover-performance sensitivity. Our results challenge the notion that high CEO pay ratios are on average economically harmful to the firm.

Key words: Pay ratio, corporate governance, firm value, acquisitions, CEO turnover-performance sensitivity

JEL: M40, M41

---

1. Introduction

In this study, we use a proprietary dataset of firm-specific information on worker salaries to examine how the ratio of CEO compensation to that of average workers, referred to as the CEO pay ratio, relates to firm value and performance. This investigation is motivated by the public outcry over the rising CEO pay ratios and the recent attempts by the U.S. Securities and Exchange Commission (SEC) to mandate the reporting of CEO pay ratios. The increasing CEO pay ratio is a key catalyst of the intense policy debate over income inequality in the U.S. For example, addressing a conference at the Federal Reserve Bank in Boston, Federal Reserve Chairwoman Janet Yellen remarked, "The extent and continuing increase in inequality in the United States greatly concern me… I think it is appropriate to ask whether this trend is compatible with values rooted in our nation's history (Da Costa 2014)." The seemingly widening gap between CEO and worker pay measured in terms of the CEO pay ratio has become a main focal point of this debate.

Currently, CEO pay ratio is not directly observable for U.S. firms. In September 2013, following a requirement of the 2010 Dodd-Frank Act, the SEC voted 3-2 to approve a proposal and seek comments on mandating firms to report their CEO pay ratio in annual proxy statements. The SEC approved the pay ratio disclosure rule on August 5, 2015 and it was expected to come into effect in 2017. However, in February 2017, the Acting Chairman of the SEC, Michael S. Piwowar decided to reconsider the implementation of the pay ratio disclosure rule and to seek more public input on the issue, prompting a possibility of delays in the adoption. However, despite the lack of publically available data on CEO pay ratio, a worker of a public corporation can compare his own pay against the CEO's because CEO pay (and that of the five highest paid executives) is publicly disclosed in proxy statements. Hence, the absence of a formal CEO pay ratio disclosure need not preclude workers from assessing the extent of disparity between their

pay and that of the CEO.[1]

While egalitarian notions of social justice and equality permeates much of the popular debate on CEO pay ratio, an important issue from an investor's point of view is whether the large disparity between senior executives and average workers adversely affects firm value. There are at least two non-mutually exclusive reasons as to why CEO pay ratio could be negatively associated with firm value and performance. First, higher CEO pay ratios can reduce employee morale and productivity. According to Akerlof and Yellen's (1990) fair wage-effort hypothesis, workers have a conception of a fair wage and when the actual wage falls short of fair wage, they would proportionately withdraw effort or quit working altogether, thus leading to a decrease in firm value and performance. Akerlof and Yellen (1990) argue that workers' conception of the "fairness" of their pay is based not only on market factors but also on how their pay compares against that of others, including senior executives of their own firm.[2] In fact, Wade, O'Reilly III, and Pollock (2006) note that CEO pay serves as a key reference point in employees' assessment of whether their own pay is "fair." If large disparities between worker pay and CEO pay result in lower productivity, we would expect firms with higher CEO pay ratios to be associated with poorer operating performances and lower firm values.

Prior research provides some support for the notion that disparities between worker and executive pay affects employee productivity. In an experimental setting, Martin (1982) finds that when the pay differential between blue-collar workers and management is large, workers express stronger feelings of dissatisfaction and injustice. Wade, O'Reilly III, and Pollock (2006) find that lower-level managers are more likely to leave the organization when they are underpaid relative to the CEO. In an influential paper that uses data from 102 business units of 41 corporations, Cowherd and Levine (1992) report that lower disparity between top management and worker pay

---

[1] In contrast, comparing their pay against others in the hierarchy such as immediate supervisors and regional managers would be more difficult because most firms enforce a policy of secrecy with respect to wages and salaries.
[2] Akerlof and Yellen (1990) motivate this concept based on relative deprivation theory (Martin 1981).

is associated with higher product quality. They attribute this finding to higher levels of commitment, effort, and cooperation expended by workers in settings where relative pay is conceived as more equitable and argue that the economic significance of their finding is material enough to reduce total production costs and increase market share and profitability.

Second, high CEO pay ratios can reflect CEO rent extraction in firms with weak corporate governance. For example, Bebchuk, Cremers, and Peyer (2011) argue that high levels of dispersion between CEO pay and the pay of other senior executives indicate CEO rent extraction and governance failure. As rank-and-file workers of a firm have less ability to extract rent, a high CEO pay ratio could signal the presence of an overcompensated CEO. Since a large body of literature documents weak corporate governance to be associated with lower firm values and poor performance (e.g., Yermack 1996; Gompers, Ishii, and Metrick 2003; Cremers and Nair 2005; Bebchuk, Cohen, and Ferrell 2009; Chhaochharia and Grinstein 2007), a link can be made between high CEO pay ratios and lower firm values and poor performances as well. It is important to note that this rent extraction argument does not necessarily suggest a causal link between CEO pay ratio and firm value/performance. Rather, both high CEO pay ratios and sub-par firm value/performance are symptomatic of the underlying corporate governance failures.

On the other hand, it could also be argued that high CEO pay ratios reflect firms' ability to secure superior CEO talent that is scarce and critical to successful running of large and complex modern corporations. Proponents of optimal contracting contend that executive compensation arrangements are efficient mechanisms designed to address agency problems between managers and shareholders and to secure scarce CEO talent (e.g., Gabaix and Landier 2008; Terviö 2008; Edmans et al 2009; Murphy 2013). Over the years, U.S. corporations have been growing both in size and complexity. Talents of senior executives such as CEOs are more scalable because

decisions made by individuals at higher levels of the organization have firm-wide implications.[3]

On the other hand, the firm-wide impact of a single rank-and-file worker is likely to be marginal at best. Therefore, the incremental talent/ability at the CEO level commands a disproportionately greater increase in compensation than the incremental talent/ability at the worker level.[4] Accordingly, from an efficient contracting viewpoint, a widening gap between CEO and worker pay can be seen as inevitable in an environment marked by larger and more complex business organizations. Along these lines, it could be argued that a wider disparity between CEO pay and average worker pay reflects firms' success in securing a more talented CEO. To the extent that this argument is valid and that more talented CEOs produce superior results, one may postulate firms with higher CEO pay ratios to exhibit higher value and superior performance.[5]

However, not all agree that CEO pay ratios provide any useful information let alone impacting firm value/performance. Some contend that a meaningful comparison of CEO pay and average worker pay is impossible because these two groups operate in entirely different labor markets with almost no overlap. Moreover, a significant portion of CEO compensation is driven by equity pay (stock and option awards) used to align CEO interest with that of shareholders.[6] This sentiment of irrelevance is distinctly evident in SEC Commissioner Daniel M. Gallagher's dissenting statement on the proposal to implement the pay ratio disclosure provision of the Dodd-Frank Act: "There are no – count them, zero – benefits that our staff have been able to

---

[3] Along these lines, Gabaix and Landier (2008) and Terviö (2008) argue that best CEOs manage the largest firms because it maximizes their impact and economic efficiency.

[4] To provide a numerical example, assume that a worker who is 10 percent more talented than the average worker receives a pay 10 percent higher than that of the average worker. Scalability argument suggests that the pay incremental commanded by a CEO who is 10 percent more talented than the average CEO is significantly greater than 10 percent.

[5] The tournament theory (Lazear and Rosen 1981) offers another argument for a positive relationship between pay disparity and firm performance where higher inter-hierarchy pay disparities promote competition and induce more effort. However, the tournament theory is unlikely to be applicable in our setting because rank-and-file employees do not compete for the CEO's job.

[6] For example, see the comment letter to SEC by the Center for Capital Market Competitiveness (https://www.sec.gov/comments/pay-ratio-statement/cll3-1664896-148926.pdf).

discern".[7]

Hence, whether, and if so, how the CEO pay ratio is associated with firm value and operating performance is an empirical question. Despite the timeliness and importance of this issue, research on CEO pay ratio is rather scant, primarily due to the difficulties in obtaining firm-level worker pay data. We overcome this data challenge by using a proprietary dataset of firm-level average worker pay, made available to us by PayScale.com.[8]

We obtain CEO pay ratios for 817 firms and measure firm value and operating performance based on one-year-ahead Tobin's q and return on assets (ROA), respectively. We isolate the effect of CEO pay ratio by controlling for a comprehensive set of firm characteristics that might affect Tobin's q and ROA, as suggested in prior research. We also industry-adjust both the CEO pay ratio and measures of firm value/performance to ensure that the results are not driven by the variations in pay ratio and value/performance across industries. Moreover, we control for contemporaneous Tobin's q and accounting performance to allay concerns of endogeneity and reverse causality.

Our results reveal a significantly positive association between CEO pay ratio and one-year-ahead Tobin's q, suggesting that, *ceteris paribus*, firms with higher CEO pay ratios have higher market value. The economic magnitude of this effect, though not excessive, is quite significant; a one-standard deviation increase in CEO pay ratio is associated with a relative increase in Tobin's q of about two percent. In examinations of firm performance, we find that CEO pay ratio is positively associated with one-year-ahead ROA as well. A one-standard deviation increase in CEO pay ratio is associated with an increase of 0.55 to 0.63 percentage points in one-year-ahead ROA, or a relative increase of 13 to 15 percent. Taken together, these findings indicate that reductions in worker productivity (if any) due to high disparity between CEO pay and average

---

[7] https://www.sec.gov/news/public-statement/2013-09-18-open-meeting-statement-dmg
[8] See Section 2 for a detailed discussion of PayScale data.

worker pay are not significant enough to have firm-wide value and performance implications. They are also inconsistent with the notion that high CEO pay ratios signal governance failures and CEO rent extraction. In contrast, our results are consistent with the argument that firms with high CEO pay ratios are likely to be managed by more capable CEOs.

Next, to provide additional insights and to increase the credibility of the inference that high pay ratios on average indicate superior CEO talent instead of governance failures, we examine the relationship between CEO pay ratio and two corporate decisions that are closely associated with the CEO: shareholder value creation through acquisitions and CEO turnover-performance sensitivity. These analyses enable us to further distinguish between the two competing arguments. First, acquisitions are important corporate investment decisions with direct CEO involvement, where more capable CEOs make better acquisitions (e.g., Morck, Shleifer, and Vishny 1990), while CEO rent extraction and governance failures lead to poor acquisition choices (e.g., Jensen and Meckling 1976; Masulis, Wang, and Xie 2007). Therefore, if high CEO pay ratios indicate the employment of more capable CEOs, we would expect a positive relationship between CEO pay ratio and the quality of acquisitions, and the opposite if high pay ratios are indicative of CEO rent extraction and governance failure. Following prior research (e.g., Masulis, Wang, and Xie 2007; Bebchuk, Cremers, and Peyer 2011), we use abnormal stock returns surrounding acquisition announcements to capture the quality of acquisitions. We find a positive relationship between CEO pay ratio and these abnormal returns. This finding is consistent with the argument that CEOs of high pay ratio firms make better acquisition decisions, corroborating the finding of the positive relationship between CEO pay ratio and firm value/performance.

Second, with respect to CEO turnover-performance sensitivity, prior research finds that entrenched CEOs in poorly-governed firms are less likely to be replaced following poor performance (e.g., Weisbach 1988; Denis, Denis, and Sarin 1997). If high CEO pay ratios are

symptomatic of CEO rent extraction and governance failures, we expect to find a negative association between CEO pay ratio and CEO turnover-performance sensitivity. Instead, we find that the sensitivity of CEO turnover to firm performance increases with CEO pay ratio, as CEOs with high pay ratios are more likely to be replaced following poor performance, which is inconsistent with the CEO entrenchment argument. This finding further strengthens our inference that, on average, high CEO pay ratios are not symptomatic of governance failures.

We conduct a series of additional analyses to ensure that our results are robust and to provide further insights. First, Bertrand and Mullainathan (2001) show that CEOs are rewarded for good firm performance even when such performance is attributable to external factors that are beyond their control. One might argue that the positive relationship between CEO pay ratio and firm value/performance stems from this pay-for-luck phenomenon that firms with good performance due to external factors award CEOs disproportionally higher compensation than the average workers, leading to a higher CEO pay ratio. However, we do not believe this to be the case because our measures of firm value and performance are industry-adjusted, thus significantly removing effects of external factors that are beyond CEOs' control. Besides, our empirical specifications capture the relationship between CEO pay ratio in the current period and firm value/performance in the *next period after controlling for* contemporaneous firm value/performance. The current period's CEO compensation in dollar amount is unlikely to be set by the board based on future performance, particularly future stock returns, which are not predictable. Moreover, the corroborative findings based on the quality of acquisitions and CEO turnover-performance sensitivity cannot be explained by the pay-for-luck phenomenon. Nonetheless, we carry out an additional analysis to further rule out this alternative explanation. Bertrand and Mullainathan (2001) find that better governed firms have a lower pay-for-luck propensity. Hence, if our main results are driven by this phenomenon, we would expect the relationship between CEO pay ratio and firm value/performance to be weaker for better

governed firms. However, we find some weak evidence that the relationship between CEO pay ratio and firm value is stronger for better governed firms, in contrary to the predictions based on the pay-for-luck phenomenon.

Second, motivated by the concern that CEO pay ratio should not provide any useful information in and of itself, we examine whether our results are driven by the pay levels of CEOs or workers, as opposed to the pay ratio itself. For this purpose, we include CEO and worker compensation levels separately as additional control variables in the regression models. Our inferences remain the same, suggesting that the *ratio* of CEO to worker pay is incrementally informative over and above the pay *levels* of each group.

Third, another alternative explanation for our results is that firms with more CEO stock-based compensation have higher CEO pay and thus higher CEO pay ratio and these firms also have higher firm value. While controlling for CEO pay level addresses this concern to a certain extent, in an additional analysis, we explicitly control for CEO pay structure in terms of stock versus cash compensation in the regressions. Our inferences remain the same.

Fourth, while CEO compensation includes deferred compensation such as pension, our worker pay data from PayScale.com might not fully account for workers' deferred compensation components. To rule out the possibility that our results are driven by this potential issue, we run additional analyses by excluding CEO deferred compensation in our measure of pay ratio. The inferences remain the same.

Fifth, the proposed SEC regulations mandate the inclusion of foreign workers when computing the pay ratio, but due to data constraints the worker pay captured in our analyses consists of pay for domestic workers only. Hence, one potential concern is that our findings are driven by firms with significant foreign operations. We allay this concern by replicating our analyses after excluding firms with significant foreign operations from the sample. Our inferences remain unchanged.

8

Sixth, we investigate whether the relation between CEO pay ratio and firm value/performance is non-linear. We find some evidence that the relationship between pay ratio and ROA is concave; ROA increases with CEO pay ratio in a decreasing rate.

Finally, the arguments for CEO pay ratio also apply to other senior executives. We investigate whether the ratio of total compensation of the top four executives other than the CEO to that of the average worker is associated with firm value and performance. Consistent with the findings on CEO pay ratio, we find that the top executive to average worker pay ratio is also positively associated with future Tobin's q and ROA.

As a whole, our results are consistent with the argument that high CEO pay ratios are indicative of firms' ability to secure highly sought-after managerial talent, which are scarce, but vital to the successful running of modern corporations. Our findings do not support the conjecture that high pay disparity between senior executives and rank-and-file workers adversely affects the firm by damaging employee morale and productivity. They are also inconsistent with the argument that high pay ratios are symptomatic of governance failures and CEO rent extraction. We believe that our study contributes to the debate on the increasing and high CEO pay ratios. Hence, our study should be of interest not only to academics and policymakers but also to the general public. However, it is worth noting that public outcry over high CEO pay ratios also centers around concerns over the perceived deterioration in social justice and fairness. While an association of high pay ratios with undesirable corporate outcomes could be construed as *prima facie* evidence of CEOs receiving unfairly high compensation, a positive association between CEO pay ratio and desirable corporate outcomes, as documented in this study, cannot be considered as sufficient evidence that corporate pay practices are indeed fair. This broader issue of fairness is beyond the scope of our paper.

Our study is closely related to two recent papers on pay ratio; Faleye et al. (2013) and Crawford et al. (2014). While these studies also document a positive association between pay

ratio and firm performance, they investigate the relationship between CEO pay ratio and firm performance in more restrictive settings. Faleye et al. (2013) restrict their sample to firms that voluntarily disclose total compensation expense while Crawford et al.'s (2014) investigation is limited to the banking industry. Hence, the results of these two studies are potentially subject to self-selection and generalizability issues. Moreover, both studies compute pay ratio as the ratio of CEO pay to total compensation expense less the compensation of the five highest-paid executives scaled by the total number of employees. This construct runs the risk of understating the true disparity between CEO pay and the pay of average rank-and-file worker because even after subtracting the five highest-paid executives' compensation, the firm's total compensation expense still includes remuneration of all other highly compensated senior employees. The data sources used in this study and the additional complementary analyses of the quality of acquisitions and CEO turnover-performance sensitivity makes our inferences more generalizable and robust.[9] Hence, alongside the extant literature, our study enables a more comprehensive understanding of the impact of CEO pay ratio on firm value and performance.

The remainder of this paper is organized as follows. Section 2 discusses data and summary statistics. Section 3 presents results on the relationship between CEO pay ratio and firm value/performance. Section 4 reports the results on the relationship between CEO pay ratio and corporate decisions. Section 5 presents additional analyses, and Section 6 concludes.

2. Data and Summary Statistics

2.1. Data

Despite much public interest, empirical research on CEO pay ratios is scarce due to data

---

[9] International studies on pay divergence between senior executives and rank-and-file workers provide conflicting results (Shin et al. 2015; Mueller et al. 2017). In any event, it is difficult to generalize international findings to the U.S. settings because CEO pay is significantly larger in the U.S. when compared with other industrialized nations (e.g., Conyon et al. 2011).

constraints. While CEO compensation is disclosed in proxy statements, firms are currently not required to report average worker pay. We overcome this problem by using a proprietary dataset of firm-level worker pay obtained from PayScale.com, the market leader in global compensation data, to calculate CEO pay ratios. PayScale.com owns the largest database of employee salary data, with over 54 million salary profiles. PayScale.com primarily gathers compensation data directly from the workers. It applies proprietary algorithms to assure the consistency of the data and complements its data collected from employees with both publicly and privately available data sources to further ensure the accuracy of its data.[10] Ensuring data accuracy is critical to PayScale.com because its revenue generation model is based on its ability to sell research reports on compensation to companies that require such information in setting their own compensation practices. Providing inaccurate/skewed compensation data would critically undermine PayScale's business model. PayScale's position as the leader in compensation data provision market attests to the broad integrity of its data.

We obtained the 2011 firm-level compensation data from PayScale.com, along with the permission to use them for research purposes. This data provides a comprehensive snapshot of worker salaries for our sample firms. Based on 20 randomly selected firms, we find that the average number of employees providing compensation information per firm is 229. The relatively large number of employees per firm indicates that the worker pay information collected by PayScale.com is likely to be representative. Despite its wide coverage and extensive data validation, PayScale.com salary data may not be completely comprehensive or accurate, but any random errors in the data should not affect our findings in a systematic manner. Further, from an empirical standpoint, what is more critical for us is that our computed CEO pay ratios provide a representative picture of *relative* pay disparity across firms rather than whether they depict the precise ratio of CEO to average worker pay at each firm. In other words, the

---

[10] Please see the detailed discussion at the company's website: http://www.payscale.com/about/methodology

possibility that the average worker pay in PayScale.com does not reflect the *true* average worker pay should not be a major concern for us as long as any biases do not systematically differ across companies. It is also worth noting that the SEC's proposed pay ratio disclosure rules allow companies to determine the median employee pay using statistical sampling methods, instead of gathering data of the entire employee population.

We combine firm-level average employee pay obtained from PayScale.com with CEO compensation data disclosed in proxy statements, as collated by Capital IQ, to calculate the CEO pay ratio. To obtain the average employee pay, we start with the compensation data of 10,602 U.S. companies, non-for-profit organizations, and government entities in the PayScale.com database. After merging this list of firms with the Compustat data, 1,590 firms remain. We then eliminate 425 firms with no data on GMI Ratings in 2011, 11 with CEO total compensation missing from Capital IQ, and 29 with median employee compensation data missing from PayScale.com. After dropping those with missing variables for regression analyses, the final sample consists of 817 firms for tests of the relationship between CEO pay ratio and firm value/performance, 105 for tests of the quality of acquisitions, and 994 for tests of CEO-turnover performance sensitivity. Table 1 summarizes the sample selection process.

[Insert Table 1 here]

2.2. Calculation of CEO Pay Ratio

We use two measures to capture the CEO pay ratio. The data provided by PayScale.com include firm-level median compensation of employees sorted by experience (i.e., "less than 1 year," "1-4 years," "5-9 years," "10-19 years," and "20+ years"). The first CEO pay ratio measure, referred to as *AverageRatio*, is defined as the ratio of CEO total compensation (including salary, bonus, stock-based compensation, long-term incentive pay, and deferred compensation such as pension) to the average of median employee compensations across all experience ranges. This measure is unlikely to be skewed by the presence of a few highly-paid

executives in PayScale.com employee data, as PayScale.com reports the median, not the mean, compensation at each experience range. The second CEO pay ratio measure, *EntryRatio*, is defined as the ratio of CEO total compensation to the median compensation of employees with the least amount of experience. Complementing *AverageRatio*, this measure captures the disparity between CEO pay and that of employees early in their careers. Both ratios are industry-adjusted and scaled by 100 in the regression analyses to facilitate result interpretation.

Because CEO compensation and average worker pay are collected from different sources, we cannot rule out the possibility that the components included in these two numbers are not identical. For example, while CEO total compensation includes deferred compensation such as pension, the average worker pay might not. Similarly, CEO total compensation includes CEOs' stock-based compensation, but most average workers do not receive stock-based compensation. Also, according to the proposed SEC regulation, the worker compensation used to calculate pay ratio includes compensation of domestic as well as foreign workers. In contrast, the worker pay collected by PayScale.com only reflects the pay of domestic workers. To address these issues, we conduct several sensitivity tests and find that our results are not driven by these factors, as discussed later.

2.3. Summary Statistics

Table 2 presents the descriptive statistics on the CEO pay ratio and the variables used in the analyses of firm value and performance. These statistics are based on the sample of 817 firms with non-missing data. All variables are winsorized at 1 and 99 percentiles. The average CEO compensation in our sample is $7,780,000, while the average employee pay is $74,365 and the average entry-level employee pay is $55,214.[11]

---

[11] The average pay in our sample is greater than the national per capita personal income of $41,560 reported by the U.S. Department of Commerce, Bureau of Economic Analysis. It should be noted that our sample consists of

The mean unadjusted *AverageRatio* (*EntryRatio*) is 103.2 (145.3), indicating that CEO compensation is 103 times (145 times) that of the average (entry) worker. These numbers are broadly consistent with the findings of a recent survey by the consulting firm Mercer that average CEO pay ratio is less than 200 for majority of firms.[12,13] To ensure that our results are not influenced by the variations in compensation practices across industries, in all regression analyses both *AverageRatio* and *EntryRatio* are industry-adjusted by subtracting the two-digit SIC industry median *AverageRatio* and *EntryRatio* from the firm ratios, respectively.[14]

[Insert Table 2 here]

3. CEO Pay Ratio and Firm Value and Performance

As previously noted, the nature of the relationship between CEO pay ratio and firm value/performance, if any, is not clear ex-ante. As per fair wage-effort theory (Akerlof and Yellen 1990), large disparity between executive pay and worker pay leads to perceptions of unfairness among workers and induce them to withdraw effort, implying a negative association between CEO pay ratios and firm value/performance. A similar observation would be expected if high CEO pay ratios are outcomes of governance failures, where the CEO is able to extract rents. This latter conjecture is based on the premise that CEOs are more capable of engaging in rent seeking behavior and getting overpaid when compared with rank-and-file workers and the large

---

employees in large listed corporations while the national statistics cover a much broader range of workers that include employees in state, not-for-profit, and agricultural sectors, along with self-employed individuals.

[12] http://www.aflcio.org/Corporate-Watch/Paywatch-2015; http://www.mercer.com/newsroom/ceo-to-employee-pay-ratios-lower-than-expected-new-mercer-survey-finds.html. Mercer did not report precise CEO pay ratio numbers. Respondents were only asked to estimate their company's pay ratio within bands (e.g. less than 100, 100 to 200, 200 to 300 etc.).

[13] Our numbers are lower than the oft-cited CEO pay ratio of over 300 reported by the trade union conglomerate AFL-CIO. However, as argued by Perry and Saltsman (2014), the AFL-CIO pay ratios are greatly inflated because they are based on CEO pay of a small sample of large multinational firms and the average worker pay of production and nonsupervisory workers from the Bureau of Labor Statistics database at the national level, as opposed to the firm level.

[14] Untabulated results show significant industry-level variations in CEO pay ratio. For example, the CEO pay ratio is only 91 for utilities, but 191 times for the metal mining industry.

body of empirical evidence indicating that governance failures lead to lower firm value and poorer performance.[15] In contrast, if CEO talent is scarce and high CEO pay ratios capture firms' ability to secure superior CEO talent, we would expect firms with higher CEO pay ratios to exhibit higher value and better performance. This argument asserts that CEO talent is more scalable than average worker talent and hence incremental CEO talent commands disproportionately greater rewards than incremental worker talent (Gabaix and Landier 2008; Terviö 2008). It is also possible that CEO pay ratio is not related to firm value/performance at all, because some argue that worker pay and CEO pay reflect entirely different labor markets and hence the pay ratio should not provide any economic insights.

As in any empirical study, however, extreme caution should be exercised in order to make strong inferences. It is possible that certain firm characteristics that give rise to particularly high or low CEO pay ratios may also be associated with high or low firm value/performance. For example, the CEO pay ratio in a particular industry may be systematically different from other industries, due to the nature of its workforce. Firm value/performance may also vary similarly across industries, and any systematic relationship between CEO pay ratio and firm value/performance will be reflective of industry-level differences rather than the earlier outlined theories. We employ a number of strategies to address this omitted correlated variable issue. First, we industry-adjust our measures of CEO pay ratios and firm value/performance so that the results cannot be attributed to industry effects. Second, to address the concern with reverse causality, we investigate the relationship between CEO pay ratio and *future* (i.e., one-year-ahead) firm value/performance after controlling for contemporaneous firm value and performance.[16] In the regression models, we therefore examine whether the current period CEO pay ratio explains the next period firm value/performance *over and above* the effect of the current period firm value

---

[15] See Yermack (1996), Core, Holthausen, and Larcker (1999), Gompers, Ishii, and Metrick (2003), Cremers and Nair (2005), Bebchuk, Cohen, and Ferrell (2009), and Bebchuk, Cremers, and Peyer (2011) for examples.
[16] Controlling for additional lagged firm value/performance leads to the same inferences.

and performance. Third, we subsequently test the relationship between CEO pay ratio and the outcomes of two key corporate decisions, the quality of acquisitions and CEO turnover-performance sensitivity. Documenting consistent results from these latter tests would greatly enhance the credibility of our main inferences. These research design choices and empirical investigations along multiple dimensions should mitigate endogeneity concerns to a great extent.

3.1. CEO Pay Ratio and Firm Value

We use the following regression model to estimate the relationship between CEO pay ratio and firm value:

$$Tobin's\ q_{t+1} = \alpha + \beta_1 CEO\ pay\ ratio_t + \beta_2 Tobin's\ q_t + \beta_3 ROA_t + \beta_k Other\ controls_t +$$

$$\varepsilon_{t+1} \tag{1}$$

We follow prior research and use Tobin's q to capture firm value (e.g., Morck, Shleifer, and Vishny 1988; Lang and Stulz 1994; Yermack 1996; Gompers, Ishii, and Metrick 2003; Bebchuk, Cremers, and Peyer 2011). As indicated previously, *Tobin's q* and *CEO pay ratio* are industry-adjusted. The coefficient of interest is that on *CEO pay ratio* (β_1). We control for lagged Tobin's *q* and accounting performance measured in terms of ROA (both industry-adjusted). Following prior research on executive compensation, we also control for variables including CEO pay slice (Bebchuk, Cremers, and Peyer 2011);[17] a composite measure of governance (governance index) comprising of the number of large shareholders, the number of large shareholders on board, board size, and board independence (Bertrand and Mullainathan 2001);[18] insider ownership and squared insider ownership (McConnell and Servaes 1990); firm size; leverage (McConnell and Servaes 1995); the ratio of R&D expenditure to total assets; an

---

[17] Bebchuk et al. (2011) show that CEO pay slice (the fraction of aggregate top executive compensation captured by the CEO) is negatively related to firm value and performance. The Pearson (Spearman) correlation between CEO pay slice and our two measures of CEO pay ratio varies between 0.385 and 0.405 (0.489 and 0.506). None of our results are sensitive to the exclusion of this control variable.

[18] See Appendix B for a detailed discussion of the construction of the governance index.

indicator variable for missing R&D amounts (Shin and Stulz 2000; Koh and Reeb 2015); the ratio of capital expenditure to assets; firm age (Bebchuk, Cremers, and Peyer 2011); business segment concentration measured as the firm-level Herfindahl index based on segment sales; and market share based on industry-level sales (Demerjian, Lev, and McVay 2012; Montgomery and Wernerfelt 1988).[19] Appendix A provides variable definitions.

Table 3 reports the regression results. *CEO pay ratio* is positively correlated with the next-period's *Tobin's q* irrespective of whether it is measured as *AverageRatio* or *EntryRatio* (t = 2.66 and 2.52, respectively). The effect is not only statistically significant, but also economically significant. A one-standard deviation increase in *AverageRatio* (*EntryRatio*) is associated with a 0.037 (0.033) increase in one-year-ahead industry-adjusted Tobin's q.[20] Given the sample mean one-year-ahead (industry-unadjusted) Tobin's q of 1.731, this represents a relative increase of 2.1 percent (1.9 percent). These findings indicate that firms with higher CEO pay ratios exhibit higher values in the subsequent period, consistent with the CEO ability view of the CEO pay ratio.

The results on control variables are largely consistent with previous studies, such as Bebchuk, Cremers, and Peyer (2011). We find that one-year-ahead industry-adjusted Tobin's q decreases with CEO pay slice and the squared insider ownership, and increases with lagged Tobin's q, insider ownership and leverage. Regressions appear quite well specified with adjusted r-squared of over 80 percent.

[Insert Table 3 here]

3.2. CEO Pay Ratio and Firm Performance

---

[19] Our tests on firm value and firm performance do not include industry fixed effects because both the dependent variable and the variable of interest are industry adjusted. However, incorporating industry fixed effects does not alter our inferences.

[20] The standard deviations of industry-adjusted *AverageRatio* and *EntryRatio* are 0.790 and 1.252 respectively (not tabulated). Therefore, the effect of *AverageRatio* is calculated as 0.79 × 0.047 and that of *EntryRatio* as 1.252 × 0.026.

We use the following regression model to estimate the relationship between CEO pay ratio and firm performance:

$$ROA_{t+1} = \alpha + \beta_1 CEO\ pay\ ratio_t + \beta_2 Tobin's\ q_t + \beta_3 ROA_t + \beta_k Other\ controls_t + \varepsilon_{t+1}$$

(2)

Model (2) is identical to Model (1) except that the dependent variable is one-year-ahead industry-adjusted ROA, which is our measure of firm performance.

Table 4 reports the regression results. We find that CEO pay ratio is significantly positively correlated with one-year-ahead ROA whether CEO pay ratio is measured as *AverageRatio* or *EntryRatio* (t = 2.62 and 3.05, respectively). In terms of economic significance, a one-standard deviation increase in *AverageRatio* (*EntryRatio*) is associated with a 0.553 (0.626) percentage point increase in one-year-ahead ROA.[21] Given that the sample average ROA is 4.3 percent, this represents a relative increase of 13 (15) percent. These findings are consistent with the earlier results on firm value and can partly explain why firms with higher pay ratios command higher values.

[Insert Table 4 here]

The combined results on the relationship between CEO pay ratio and firm value/performance lend credence to the view that firms with higher pay ratios employ more capable CEOs. These findings are inconsistent with the views that deteriorating employee morale due to high pay dispersion leads to discernible declines in firm value/performance and that high CEO pay ratios reflect governance failures/CEO rent extraction.

4. CEO Pay Ratio and Corporate Outcomes

In this section, we investigate whether CEO pay ratio is associated with value creation through acquisitions and CEO turnover-performance sensitivity. The objectives of the

---

[21] The effect of *AverageRatio* is calculated as 0.79 × 0.007 and that of *EntryRatio* as 1.252 × 0.005.

investigation are three-fold. First, investigating these corporate outcomes, which are closely related to the CEO, enables us to make stronger inferences. Second, this investigation will enable us to further distinguish between the alternative views on high pay ratios: governance failure vs. CEO ability. Third, if these additional analyses provide consistent results, they will alleviate any remaining concerns that our previous findings on CEO pay ratio and firm value/performance are driven by omitted correlated variables.

4.1. CEO Pay Ratio and Value Creation through Acquisitions

Acquisitions are important corporate investment decisions, and CEOs are the main decision makers (e.g., Grinstein and Hribar 2004; Malmendiera and Tate 2008; Yim 2013). Hence, the quality of acquisitions reflects their ability and incentives. Morck, Shleifer, and Vishny (1990) find that more talented CEOs make better acquisition decisions. On the other hand, CEOs of poorly governed firms may use acquisitions for self-serving, empire-building purposes and destroy shareholder value (e.g., Jensen and Meckling 1976; Masulis, Wang, and Xie 2007).

The predictions on the link between CEO pay ratio and the propensity to make value-creating acquisitions depend on the reasoning behind high CEO pay ratios. If in general they are symptomatic of governance failures and CEO rent extraction, given the empire-building propensities of entrenched managers (e.g., Jensen and Meckling 1976), we would expect a negative relationship between CEO pay ratio and the quality of acquisitions. However, if firms with higher CEO pay ratios indeed have more capable CEOs, we would expect a positive association between CEO pay ratio and the quality of acquisitions.

Following previous studies (e.g., Masulis, Wang, and Xie 2007; Bebchuk, Cremers, and Peyer 2011), we use abnormal stock returns surrounding acquisition announcements to capture the quality of acquisitions and estimate the following regression model to investigate this issue:

$$CAR = \alpha + \beta_1 CEO\ pay\ ratio + \beta_k Controls + \varepsilon \qquad (3)$$

For this analysis, we focus on firms with acquisitions in the following year, and this

requirement restricts the sample to 105 observations.[22] The dependent variable is the acquirers'

3-day ([-1, +1]) cumulative abnormal return surrounding the acquisition announcement (*CAR*).

The mean (median) *CAR [-1,+1]* for the sample is 0.010 (0.005) with a standard deviation of

0.055. The variable of interest is *CEO pay ratio*. If firms with high CEO pay ratios are more

likely to make value-creating acquisitions, we expect the coefficient on *CEO pay ratio* to be

positive, and the opposite if high CEO pay ratios are indicative of CEO rent extraction.

We follow Bebchuk, Cremers, and Peyer (2011) to control for acquirer characteristics

including CEO pay slice, the governance index, firm size, Tobin's q, ROA, leverage, the ratio of

R&D expenditure to total assets, a binary variable for missing R&D expenditure, the ratio of

capital expenditure to assets, firm age, business segment concentration, market share, and the

compounded annual stock return in the year before the acquisition. We control for the relative

deal size measured as the ratio of the deal value to the acquirer's beginning-of-month market

value of equity and binary variables indicating whether the target is a public or private company

and whether it is a subsidiary. We also control for industry fixed effects.

Table 5 reports the regression results. The coefficient on *CEO pay ratio* is significantly

positive whether pay ratio is measured as *AverageRatio* or *EntryRatio* (t = 2.02 and 2.59,

respectively). CEOs of firms with higher CEO pay ratios are therefore more likely to make

value-creating acquisition decisions. This finding is consistent with the notion that, on average,

CEOs of firms with high CEO pay ratios make better acquisition decisions, corroborating our

earlier findings that CEO pay ratio is positively associated with firm value and performance. If

the previously observed positive associations between CEO pay ratio and firm

value/performance are driven by omitted correlated variables, it is unlikely that we would

---

[22] Acquisition data is obtained from the SDC Platinum database. To ensure that we only focus on acquisitions that are economically meaningful, where direct CEO involvement is likely, we limit our analyses to acquisitions where the transaction value is at least five percent of the acquirer's market value of equity. We also remove the observations with CEO turnover from year *t* to year *t*+1 to ensure that the acquisition decision is made by the same CEO reflected in our pay ratio measure.

observe a positive relationship between CEO pay ratio and the quality of acquisitions.

[Insert Table 5 here]

4.2. CEO Pay Ratio and Turnover-Performance Sensitivity

Next, we investigate the relationship between CEO pay ratio and CEO turnover-performance sensitivity to further corroborate our inference that on average higher CEO pay ratios appear to reflect firms' ability to secure scarce CEO talent rather than governance failures. The ability to replace poorly-performing CEOs indicates the efficacy of firms' corporate governance (Coughlan and Schmidt 1985; Warner, Watts, and Wruck 1988). Prior research finds that when corporate governance is weak, CEOs are less likely to be replaced following poor performance, leading to lower turnover-performance sensitivity (e.g., Weisbach 1988; Denis, Denis, and Sarin 1997). Accordingly, if high CEO pay ratios are associated with governance failures and CEO rent extraction, then CEO turnover-performance sensitivity will decrease with pay ratio.

We estimate the following regression model to examine this issue:

$$Pr(CEO\ Turnover_{t+1} = 1) = \alpha + \beta_1 RET_t + \beta_2 CEO\ pay\ ratio_t + \beta_3 RET_t \times$$

$$CEO\ pay\ ratio_t + \beta_k Controls_t + \varepsilon_{t+1} \qquad (4)$$

The dependent variable is a binary variable that equals one if the firm appoints a new CEO in the following year and zero otherwise. In our sample we find 80 instances of CEO turnover. Turnover-performance sensitivity is captured by the correlation between the current period cumulative stock return (RET) and the likelihood of CEO turnover in the next period. Accordingly, the coefficient on RET (β_1) is expected to be negative. If the turnover-performance sensitivity is decreasing (increasing) with CEO pay ratio, we would expect the coefficient on the interaction term $RET \times CEO\ pay\ ratio$ (β_3) to be positive (negative).

Following prior research, we control for *CEO pay slice*, the fraction of board members

appointed after the CEO assumed office (*Board Co-option*), the percentage of shares owned by the CEO (*CEO ownership*), and an indicator variable for whether the CEO is also the chairman of the board (*CEO/Chair duality*), along with their interactions with *RET*. These factors have been found to be associated with CEO turnover-performance sensitivity (e.g., Bebchuk, Cremer, and Peyer 2011; Coles, Daniel, and Naveen 2014). Following Bebchuk, Cremer, and Peyer (2011) we include an indicator variable for whether the CEO is over 60 years old (*CEO Age ≥ 60*), and indicator variables for different levels of CEO tenure.[23] We also control for industry fixed effects.

Columns (1) and (2) of Table 6 report the logit regression results with *AverageRatio* and *EntryRatio* as the measures of CEO pay ratio, respectively. We find that the coefficient on the interaction term *RET × CEO pay ratio* is significantly negative in both columns (t = -2.78 and -2.67, respectively). That is, CEO turnover-performance sensitivity is higher for firms with higher CEO pay ratios. These results are inconsistent with the argument that high CEO pay ratios reflect governance failures.

[Insert Table 6 here]

To investigate whether the relationship between CEO pay ratio and turnover-performance sensitivity is driven by factors beyond CEOs' control (Jenter and Kanaan 2015), we split the stock return into firm-specific returns (*Firm-specific RET*) and market returns (*Market RET*), and replace *RET* in Equation (4) with these two variables. We capture firm specific returns as the difference between the realized firm return and the estimated return for the firm based on the market model. The betas are estimated from the market model over a 60-month period prior to the fiscal year end. Columns (3) and (4) of Table 6 report the results. The coefficient on the interaction term *Firm-specific RET × CEO pay ratio* is significantly negative (t = -3.31 and -

---

[23] Specifically, we follow Bebchuk, Cremer, and Peyer (2011) and include dummy variables to indicate whether CEO tenure is 1, 2, 3, 4, 5, 6, or greater than 6 years.

3.21, respectively), but that on *Market RET × CEO pay ratio* is statistically insignificant. That is, the relationship between CEO pay ratio and turnover-performance sensitivity applies to firm-specific returns, over which the CEO has more control, but not to market returns, which are beyond the CEO's control.[24]

In sum, the results reported in this section reject the notion that high CEO pay ratios result from governance failure. Instead they further strengthen our previous inferences that higher CEO pay ratios are indicative of firms' success in attracting scarce CEO talent, which enhances firm value and improves performance.

5. Additional Analyses

5.1. Pay-for-luck and the Effect of Corporate Governance

Bertrand and Mullainathan (2001) argue that when rent-seeking CEOs capture the pay-setting process, higher firm value and performance result in disproportionately higher CEO pay even when they do not contribute to the favorable outcomes. Consistent with their argument, Bertrand and Mullainathan (2001) find that CEO pay is as sensitive to the results of macro factors that are beyond CEOs' control as it is to the factors that are within their control. They refer to this phenomenon as "pay-for-luck," and find it is more pronounced in firms with weak governance.

The pay-for-luck phenomenon is unlikely to explain our findings for two reasons. First, because our measures of firm value and performance are industry adjusted, they are less likely to reflect common, external factors. Second, since we investigate the relationship between CEO pay ratio and the one-year-ahead, not the contemporaneous, firm value/performance and also control

---

[24] To ensure that our results on turnover-performance sensitivity are not confounded by well-performing firms, in an untabulated additional analysis we separate good from bad performers by the median contemporaneous industry-adjusted Tobin's q or ROA. We find that the coefficient on the interaction term *RET × CEO pay ratio* is significantly negative for bad performers (i.e., firms with Tobin's q or ROA below the sample median), but not for good performers (i.e., those with Tobin's q or ROA above the sample median).

for the contemporaneous firm value and performance in the analyses; if the pay-for-luck argument could explain our results, the CEOs must be able to anticipate changes in future firm value/performance and effectively incorporate them into their current year's compensation packages. This is rather unlikely, especially in the case of firm value, because changes in stock prices are difficult to anticipate. Nonetheless, to further rule out the pay-for-luck alternative explanation, we examine whether our earlier findings on firm value/performance are affected by corporate governance in a predictable manner. Because the pay-for-luck phenomenon is more pronounced for firms with poor corporate governance, if it drives our results, we would expect the positive relationship between CEO pay ratio and firm value/performance to be more pronounced for these firms than for others. We test this prediction by adding the interaction term of *Governance Index* with *CEO pay ratio* to Models (1) and (2). If our earlier findings are driven by the pay-for-luck phenomenon, we would expect a negative coefficient on the interaction term *CEO pay ratio × Governance Index*.

Following Bertrand and Mullainathan (2001), we construct the *Governance Index* using four governance variables: the number of blockholders, the number of blockholders on the board, (negative value of) board size, and board independence. A blockholder is defined as a shareholder who owns at least five percent of the common shares in the company. Shareholder ownership is collected from Capital IQ. *Board size* is the number of directors on the board. *Board Independence* is the percentage of independent directors on the board. Board directors' ownership, board size, and the classification of independent directors are obtained from GMI Ratings. *Governance Index* is the unweighted sum of the four standardized governance variables. Specifically, we form the index by demeaning each of the four variables, dividing them by their respective standard deviations, and then taking the sum of the four standardized variables. Higher values of *Governance Index* indicate stronger governance. Appendix B presents summary

statistics on the governance variables used to construct *Governance Index*.[25]

Table 7 reports the regression results. The first two columns report results with *Tobin's q* as the dependent variable and the last two report those with *ROA* as the dependent variable. The coefficient on the interaction term between *CEO pay ratio* and *Governance index* is not statistically negative in any of the specifications. In fact, this coefficient is positive and marginally significant in the first column of Table 7 (t = 1.73), suggesting that the positive relationship between CEO pay ratio and one-year-ahead Tobin's q is stronger for better governed firms.

[Insert Table 7 here]

In sum, the results reported in this section indicate that the positive relationship between CEO pay ratio and firm value/performance is not driven by the pay-for-luck phenomenon.

5.2. *Controlling for CEO and Employee Compensation Levels and CEO Compensation Structure*

One could argue that our findings may merely be a CEO pay effect rather than a pay ratio effect. However, no previous research lends strong support to this argument. For instance, Core, Haulthausen, and Larcker (1999) find that CEOs are able to extract additional compensation from the firm when corporate governance is weak and that the excess compensation is negatively associated with subsequent firm operating and stock return performance. Similarly, one could argue that employee pay levels, rather than the ratio of CEO to employee pay, drive our results. To address these concerns, we reexamine the relationship between CEO pay ratio and firm value/performance after controlling for both the level of CEO compensation (*Ln(CEOComp)*) and the level of employee compensation (*Ln(EmployeeComp)*) at the average as well as entry

---

[25] The sample used to construct the index includes all of the 1,165 firms that are covered in GMI Ratings in fiscal year 2011. The calculation of *Governance Index* is based on an unbalanced panel and therefore its mean is not zero.

level.[26]

Panel A of Table 8 reports the results on the relationship between pay ratio and future *Tobin's q* and *ROA* with the inclusion of these additional controls. As before, the coefficient on CEO pay ratio remains significantly positive whether measured as *AverageRatio* or *EntryRatio*, so that the positive relationship between CEO pay ratio and future firm value/performance is robust to controlling for CEO and employee compensation levels. Interestingly, we find a positive association between *Ln(CEOComp)* and *Tobin's q*, but the association between *Ln(CEOComp)* and *ROA* is insignificant. We do not find employee compensation levels to be significantly associated with either *Tobin's q* or *ROA*.[27]

[Insert Table 8 here]

Our results may also be driven by the variation in CEO stock-based compensation, as CEOs with more stock-based compensation are paid extra risk premiums due to the risk they bear, leading to higher total compensation. This leads to a higher CEO pay ratio in firms with higher CEO stock-based compensation. Further, the incentives of these CEOs are better aligned with those of shareholders and they work harder, leading to higher firm value and performance (Hanlon et al. 2003). While others argue that stock-based compensation is not correlated with firm value in equilibrium (Larcker 2003), we address this issue by directly controlling for the structure of CEO compensation. Specifically, we add the CEO stock-based compensation to total compensation ratio to the regression as an additional control variable. As reported in Panel B of Table 8, our inferences remain the same: the coefficient on CEO pay ratio remains positive with

---

[26] We do not include these variables in our main analyses due to concerns of multicolinearity. The Pearson correlation between *Ln(CEOComp)* and *AverageRatio* is 0.626. The Pearson correlation between *Ln(CEOComp)* and *EntryRatio* is 0.596. The Pearson correlation between *Ln(EmployeeComp) (Average)* and *AverageRatio* is -0.048. The corresponding figure for *Ln(EmployeeComp) (Entry)* and *EntryRatio* is -0.232. In addition, we do not have strong reasons to believe that the level of CEO or worker pay affects future firm value/performance.

[27] Relatedly, one may argue that CEO pay ratio somehow captures a non-linear dimension of the relationship between CEO pay and firm value/performance that does not get purged by controlling for CEO pay level. While it is impossible to completely rule out this argument, it still asserts that CEO pay ratio is an economically insightful construct.

both Tobin's q and ROA as dependent variables.

5.3. Calculation of CEO Pay Ratio

Because CEO compensation and average worker pay data are gathered from different sources, it is possible that the compensation components included in these two variables are different. To ensure that our results are not driven by these differences, we conduct a number of sensitivity tests. Our inferences remain the same. For brevity, we do not tabulate these sensitivity tests.

First, while total CEO compensation used to measure pay ratio include deferred compensation components such as pensions, it is unlikely that employees take deferred compensation into account when reporting their pay to PayScale.com. In order to assess whether our results are driven by this potential difference between CEO pay and worker pay, we re-run our tests by excluding deferred compensation from CEO pay. Untabulated tests indicate that our results are not sensitive to the inclusion of deferred compensation in CEO pay.

Second, we test whether our results are sensitive to employees not reporting or underestimating their stock-based compensation. While stock-based compensation is not a significant component of rank-and-file employee compensation in many industries, this may not be the case for firms in high-tech industries. Therefore, in a robustness test we remove high-tech firms from our sample and re-run the tests. Our results continue to hold, indicating that the potential underestimation or exclusion of employees' stock-based compensation is unlikely to drive our results. In addition, as discussed above, explicitly controlling for CEO stock-based compensation in the analyses leads to the same inferences.

Third, according to the SEC regulation, the worker compensation used to measure pay ratio includes compensation of both domestic and foreign workers. However, the worker pay collected by PayScale.com and used in this paper only reflects domestic worker pay. Therefore,

for firms with significant foreign operations and thus significant number of foreign workers, our pay ratio measure likely differs from the SEC pay ratio. To ensure that our results are not driven by firms with significant foreign operations, we exclude firms in the top quintile of the ratio of foreign income to domestic income and then re-run our tests. Our results continue to hold (untabulated), suggesting that they are not driven by firms with significant foreign operations.

5.4. Potential Non-linearity

Consistent with the CEO ability view, our primary results indicate a positive association between pay ratio and firm value/performance. However, this relationship need not be linear. We explore the possibility of a nonlinear relationship between CEO pay ratio and firm value/performance by adding the squared term of *CEO Pay Ratio* to Equations (1) and (2) and report the results in Table 9.

In Table 9, the first two columns use Tobin's q as the dependent variable and the last two columns ROA. We find that the coefficient on the squared term, *CEO pay ratio^2*, is negative in all four columns, suggesting that the relationship between pay ratio and firm value/performance is concave, although the coefficient is statistically significant only with ROA as the dependent variable. That is, firm performance appears to improve with CEO pay ratio at a decreasing rate.[28]

[Insert Table 9 here]

5.5. Pay Ratio Measured with Top Officers Other than the CEO

The debate on whether executives are paid excessively compared to workers has so far focused on the ratio of CEO to average worker pay, but the arguments concerning CEO pay ratios also apply to those of senior executives. For example, senior executive talent in general

---

[28] While the association between pay ratio and industry-adjusted ROA is concave, untabulated analyses indicate that this relationship becomes negative only when the values *AverageRatio* and *EntryRatio* are above the 99th percentile of the sample distribution.

should be more scalable than worker talent and hence incremental ability at senior executive level should command disproportionately larger wage increases than incremental ability at worker level does. If so, the positive association observed between CEO pay ratio and firm value/performance should also be observed when CEO pay ratio is replaced with the ratio of senior executive pay to worker pay. Therefore, to further strengthen our earlier findings, we investigate the relationship between the ratio of senior executive pay to worker pay and firm value/performance. For this purpose, we define senior executive pay ratio as the total compensation of the four highest paid executives other than the CEO over the average worker's pay (*Top 4 Pay Ratio*). We measure *AverageRatio* and *EntryRatio* along the lines previously discussed.

Table 10 report the regression results. As conjectured, we find that *Top 4 Pay Ratio* is positively associated with *Tobin's q* and *ROA* irrespective of whether the ratio is measured as *AverageRatio* or *EntryRatio*. These findings suggest that our results extend beyond CEO pay ratio and can be generalizable to the pay ratio between other top senior executives and the average worker.

[Insert Table 10 here]

6. Conclusions

There is intense public debate over the causes and consequences of wide and seemingly growing disparity between the pay of senior executives such as CEOs and rank-file-workers. Our paper attempts to inform this debate by examining whether CEO pay ratios are associated with firm-level economic outcomes. High CEO pay ratios could result in lower firm values and poor operating performances because they can lead to perceptions of unfairness among workers, which might in turn cause them to expend less effort and withdraw from work. A similar association is also expected if high pay ratios reflect corporate governance failures where CEOs

are overcompensated. On the other hand, greater scalability of CEO talent (when compared with rank-and-file workers) suggests that incremental CEO ability would receive disproportionately higher incremental compensation than incremental rank-and-file worker ability does. If so, higher CEO pay ratios would signal firms' success at hiring more capable CEOs. Per this argument, CEO pay ratios should be positively associated with firm value/performance.

Conducting empirical research on CEO pay ratio is challenging because firms are currently not required to disclose average worker pay. While the recent SEC rule requires firms to disclose the CEO to average worker pay ratio, there is considerable uncertainty as to whether it would be enforced. We overcome this data issue by using a proprietary dataset that contains reliable information on firm level average worker pay.

Consistent with the notion that high CEO pay ratios reflect firms' ability to secure scarce CEO talent, we find that industry-adjusted CEO pay ratio is positively associated with one-year-ahead firm value and performance. Corroborating these results, we also find that firms with high CEO pay ratios are more likely to make value-enhancing acquisitions and have higher CEO turnover-performance sensitivity. Inconsistent with the pay-for-luck phenomenon, we do not find the positive relationship between CEO pay ratio and firm value/performance to be stronger for firms with weak governance. Our results are robust to controlling for CEO and worker pay levels and CEO pay structure, suggesting that our findings on CEO pay ratio are incremental to the effects of pay levels and structure. Additional tests also reveal that the relationship between CEO pay ratio and firm performance is concave. Finally, we show that the positive association between CEO pay ratio and firm value/performance can be extended to the ratio of other top senior executive pay to average worker pay.

Overall, our results suggest that the demoralizing effects (if any) of high pay disparity between senior executives and workers are not sufficiently large enough to harm the overall firm value/performance. Our results also suggest that, on average, high pay ratios are not symptomatic

of corporate governance failures and CEO rent extractions. Instead, the results are consistent with the argument that high CEO pay ratios are an outcome of market competition for scarce CEO talent. It is important to note that our findings do not suggest that high CEO pay ratios *cause* higher firm values and/or superior performance. Rather, they are in line with the argument that firms obtaining scarce CEO talent leads to greater disparities between CEO and average worker pay. These findings provide useful insights to policy makers and the public who are keen to understand the reasons behind high CEO pay ratios.

While our findings dispel the notion that high CEO pay ratios result in deteriorations in the overall firm value/performance, it is worth noting that our sample is purely cross-sectional. Hence, we are unable to investigate the effects of within-firm time series changes in the pay gap between senior executives and average workers.[29] We also note that our study focuses on economic aspects of pay disparity between senior executives and average workers and does not allude to broader social norms such as fairness and social equity. These unresolved issues leave room for fruitful future research.

---

[29] Conventional wisdom seems to suggest that intra-firm pay dispersion has been increasing over time. However, some recent studies question this notion and attribute rising income inequality over the past few decades to inter-firm rather than intra-firm increases in pay dispersion (Song et al. 2015; Barth et al. 2016).

References

Akerlof, G. A., and Yellen, J. L. 1990. The fair wage-effort hypothesis and unemployment. *The Quarterly Journal of Economics*, 105(2), 255-283.

Barth, E., Bryson, A., Davis, J. C., and Freeman, R. 2016. It's where you work: Increases in the dispersion of earnings across establishments and individuals in the United States. *Journal of Labor Economics*, 34(S2), S67-S97.

Bebchuk, L., A. Cohen, and A. Ferrell. 2009. What matters in corporate governance? *Review of Financial Studies*, 22(2), 783-827.

Bebchuk, L. A., K. M. Cremers, and U. C. Peyer. 2011. The CEO pay slice. *Journal of Financial Economics*, 102(1), 199-221.

Bertrand, M., and S. Mullainathan. 2001. Are CEOs rewarded for luck? The ones without principals are. *Quarterly Journal of Economics*, 116(3), 901-932.

Chhaochharia, V., and Grinstein, Y. 2007. Corporate governance and firm value: The impact of the 2002 governance rules. *The Journal of Finance*, 62(4), 1789-1825.

Coles, J. L., N. D. Daniel, and L. Naveen. 2014. Co-opted boards. *Review of Financial Studies*, 27(6), 1751-1796.

Conyon, M. J., J. E. Core, and W. R. Guay. 2011. Are U.S. CEOs paid more than U.K. CEOs? Inferences from risk-adjusted pay. *The Review of Financial Studies*, 24(2), 402-438.

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

Coughlan, A. T., and R. M. Schmidt. 1985. Executive compensation, management turnover, and firm performance: An empirical investigation. *Journal of Accounting and Economics*, 7(1), 43-66.

Cowherd, D. M., and Levine, D. I. 1992. Product quality and pay equity between lower-level employees and top management: An investigation of distributive justice theory. *Administrative Science Quarterly*, 302-320.

Crawford, S., K. K. Nelson, and B. Rountree. 2014. The CEO-employee pay ratio. Working paper, University of Houston, and Rice University.

Cremers, K. J., and V. B. Nair. 2005. Governance mechanisms and equity prices. *The Journal of Finance*, 60(6), 2859-2894.

Da Costa, P., N. 2014. Yellen decries widening wealth disparity. *Wall Street Journal* (October 17): A2.

Demerjian, P., B. Lev, and S. McVay. 2012. Quantifying managerial ability: A new measure and validity tests. *Management Science*, 58(7), 1229-1248.

Denis, D. J., D. K. Denis, and A. Sarin. 1997. Ownership structure and top executive turnover. *Journal of Financial Economics*, 45(2), 193-221.

Edmans, A., Gabaix, X., and Landier, A. 2009. A multiplicative model of optimal CEO incentives in market equilibrium. *Review of Financial Studies*, 22(12), 4881-4917.

Faleye, O., E. Reis, and A. Venkateswaran. 2013. The determinants and effects of CEO–employee pay ratios. *Journal of Banking & Finance*, 37(8), 3258-3272.

Fama, E. F., and K. R. French. 1997. Industry costs of equity. *Journal of Financial Economics*, 43(2), 153-193.

Gabaix, X., and Landier, A. 2008. Why has CEO pay increased so much?. *The Quarterly Journal of Economics*, 123(1), 49-100.

Gompers, P., Ishii, J., and Metrick, A. 2003. Corporate governance and equity prices. *Quarterly Journal of Economics*, 107-155.

Grinstein, Y., and P. Hribar. 2004. CEO compensation and incentives: Evidence from M&A bonuses. *Journal of Financial Economics*, 73(1), 119-143.

Hanlon, M., S. Rajgopal, and T. Shevlin. 2003. Are executive stock options associated with future earnings? *Journal of Accounting and Economics,* 36: 3-43.

Jenter, D., and F. Kanaan. 2015. CEO turnover and relative performance evaluation. *The Journal of Finance*, 70(5), 2155-2184.

Jensen, M. C., and W. H. Meckling. 1976. Agency costs and the theory of the firm. *Journal of Financial Economics*, 3(4), 305-360.

Koh, P. S., and D. M. Reeb. 2015. Missing R&D. *Journal of Accounting and Economics*, 60(1), 73-94.

Lang, L. H. P., and Stulz, R. M. 1994. Tobin's q, corporate diversification, and firm performance. *Journal of Political Economy*, 102(6), 1248-1280.

Larker, D. F. 2003. Discussion of "Are executive stock options associated with future earnings?" *Journal of Accounting and Economics* 36: 91-103.

Lazear, E. P., and Rosen, S. 1981. Rank-order tournaments as optimum labor contracts. *Journal of political Economy*, 89(5), 841-864.

Malmendier, U., and G. Tate. 2008. Who makes acquisitions? CEO overconfidence and the market's reaction. *Journal of Financial Economics*, 89(1), 20-43.

Martin, J. 1981. Relative Deprivation: A Theory of Distributive Injustice for an Eram of Shrinking Resources. In Research in Organizational Behavior: An Annual Series of Analytical Essays and Critical Reviews, edited by L. L. Cummings and Barry M. Staw,, volume 3. Greenwich, CT: JAI Press.

Martin, J. 1982. The fairness of earnings differentials: An experimental study of the perceptions of blue-collar workers. *The Journal of Human Resources*, 17(1), 110-122.

Masulis, R. W., C. Wang, and F. Xie. 2007. Corporate governance and acquirer returns. *The Journal of Finance*, 62(4), 1851-1889.

McConnell, J. J., and H. Servaes. 1990. Additional evidence on equity ownership and corporate value. *Journal of Financial Economics*, 27(2), 595-612.

McConnell, J. J., and H. Servaes. 1995. Equity ownership and the two faces of debt. *Journal of Financial Economics*, 39(1), 131-157.

Montgomery, C. A., and Wernerfelt, B. 1988. Diversification, ricardian rents, and Tobin's q. *The Rand Journal of Economics,* 19(4), 623-632.

Morck, R., A. Shleifer, and R. W. Vishny. 1988. Management ownership and market valuation: An empirical analysis. *Journal of Financial Economics*, 20(1-2), 293-315.

Morck, R., A. Shleifer, and R. W. Vishny. 1990. Do managerial objectives drive bad acquisitions? *The Journal of Finance*, 45(1), 31-48.

Mueller, H. M., Ouimet, P. P., and Simintzi, E. 2017. Within-firm pay inequality. *The Review of Financial Studies, forthcoming.*

Murphy, K. J. 2013. Executive compensation: Where We Are, and How We Got There. In *Handbook of Labor Economics*, edited by G. Constantinides, M. Harris, and R. Stulz. Amsterdam: North Holland.

Perry, M. J., and M. Saltsman. 2014. About that CEO/Employee pay gap. *Wall Street Journal* (October 13).

Shin, H. H., and R. M. Stulz. 2000. Firm value, risk, and growth opportunities. Working paper, National Bureau of Economic Research, Cambridge, MA.

Shin, J., Kang, S., Hyun, J., and Kim, B., 2015. Determinants and performance effects of executive pay multiples: Evidence from Korea. *ILR Review 68*(1), 53-78.

Song, J., Price, D. J., Guvenen, F., Bloom, N., and Von Wachter, T. 2015. Firming up inequality (No. w21199). National Bureau of Economic Research.

Terviö, M. 2008. The difference that CEOs make: An assignment model approach. *The American Economic Review*, 98(3), 642-668.

Wade, J. B., O'Reilly III, C. A., and Pollock, T. G. 2006. Overpaid CEOs and underpaid managers: Fairness and executive compensation. *Organization Science*, 17(5), 527-544.

Warner, J. B., R. L. Watts, and K. H. Wruck. 1988. Stock prices and top management changes. *Journal of Financial Economic*s, 20, 461-492.

Weisbach, M. S. 1988. Outside directors and CEO turnover. *Journal of Financial Economics*, 20, 431-460.

Yermack, D. 1996. Higher market valuation of companies with a small board of directors. *Journal of Financial Economics*, 40(2), 185-211.

Yim, S. 2013. The acquisitiveness of youth: CEO age and acquisition behavior. *Journal of Financial Economics*, 108(1), 250-273.

APPENDIX A Variable Definitions

Variables	Definitions
Tobin's q	Tobin's q is the market value of equity plus the book value of assets minus the book value of equity, divided by the book value of total assets. In the regression analysis, we use industry adjusted measures by subtracting the four-digit SIC industry median Tobin's q of all Compustat firms from the firm Tobin's q.
ROA	ROA is earnings before extraordinary items and discontinued operations divided by total assets. In the regression analysis, we use industry adjusted measures by subtracting the four-digit SIC industry median ROA of all Compustat firms from the firm ROA.
CEO pay ratio (AverageRatio)	CEO-to-employee total compensation ratio, measured as CEO's total compensation (data source: Capital IQ) / average of median employee compensations across experience categories (data source: PayScale.com). The experience categories where median salaries are reported by PayScale.com are; "less than 1 year," "1-4 years," "5-9 years," "10-19 years," "20+ years." In the regression analyses, we use industry-adjusted measures by subtracting the two-digit SIC industry median *AverageRatio* from the firm ratio, and then dividing the difference by 100.
CEO pay ratio (EntryRatio)	CEO to entry-level employee total compensation ratio, measured as CEO's total compensation (data source: Capital IQ)/median compensation for employees with least amount of experience (data source: PayScale.com). In the regression analyses, we use industry-adjusted measures by subtracting the two-digit SIC industry median *EntryRatio* from the firm ratio, and then dividing the difference by 100.
Top 4 pay ratio (AverageRatio)	Non-CEO Top 4 executives' total compensation ratio, measured as [Top 5 executives' total compensation – CEO's total compensation] (data source: Capital IQ)/average of median employee compensations across experience categories (data source: PayScale.com). In the regression analyses, we use industry-adjusted measures by subtracting the two-digit SIC industry median *AverageRatio* from the firm ratio, and then dividing the difference by 100.
Top 4 pay ratio (EntryRatio)	Non-CEO Top 4 executives to entry-level employee total compensation ratio, measured as [Top 5 executives' total compensation – CEO's total compensation] (data source: Capital IQ) /median compensation for employees with least amount of experience (data source: PayScale.com). In the regression analyses, we use industry-adjusted measures by subtracting the two-digit SIC industry median *EntryRatio* from the firm ratio, and then dividing the difference by 100.
Ln(CEOComp)	The natural logarithm of CEO total compensation (data source: Capital IQ).
CEO Pay Slice	The ratio of CEO total compensation to the sum of the top five executives' total compensation (data source: Capital IQ).
Governance Index	The unweighted sum of the four standardized governance variables: the number of blockholders, the number of blockholders on the board, negative of board size, and the fraction of fully independent directors. A blockholder is a shareholder that owns more than five percent of the common shares in the company. Board size is the number of members of board directors. To standardize the measures, we demean each of the four variables and divide by their respective standard deviations. Governance Index is constructed based on Bertrand and Mullainathan (2001).
Insider Ownership	The Estimated percentage of outstanding shares held by top management and directors as reported by GMI Ratings.
Ln(Sales)	The natural logarithm of sales.

Leverage	The long-term debt to total asset ratio.
R&D	R&D expenses divided by total assets. If R&D is missing, it is set to zero.
R&D Missing	An indicator variable equal to one if R&D is missing, and zero otherwise.
Capital Expenditure	Capital expenditures divided by total assets.
Firm Age	The natural logarithm of the number of years the firm has been listed on Compustat at the end of fiscal year 2011.
Business Segment Concentration	Firm-level segement Herfindahl index based on segment sales. Specifically, the ratio of ratio of individual business segment sales to total sales is squared and summed across all business segments for the fiscal year. If the firm is not in the segment file, it is assigned a concentration of one.
Sales Market Share	The percentage of sales earned by the firm within its Fama and French (1997) industry at the fiscal year.
CAR [-1, +1]	The cumulative abnormal announcement return of the bidder in the [-1, +1] day window around the acquisition announcement.
Relative Deal Size	The ratio of the takeover deal value (from SDC) to the market value of equity of the bidder at the beginning of the takeover month.
Prior RET	The compounded stock return in one year before the takeover.
Public (Target)	An indicator variable equal to one if the target of the takeover is a public company, and zero otherwise.
Subsidiary (Target)	An indicator variable equal to one if the target of the takeover is a subsidiary, and zero otherwise.
CEO Turnover	An indicator equal to one if the CEO of the firm in fiscal year 2012 is not the same as that in year 2011, and zero otherwise.
RET	*RET* is the compounded stock return in fiscal year 2011.
Firm-Specific RET	The cumulative market-model residual return in fiscal year 2011. The betas are estimated from the market model over a 60-month period prior to the fiscal year end.
Market RET	The cumulative value-weighted market return in fiscal year 2011.
Board Co-option	The number of directors appointed after the CEO assumed office ("co-opted" directors) divided by the board size.
CEO/Chair Duality	An indicator variable equal to one if the CEO is also the Chairman, and zero otherwise.
CEO Ownership	The percentage of outstanding shares held by the CEO.
CEO Age $\geq$ 60	An indicator equal to one if the CEO's age is above 60, and zero otherwise.

APPENDIX B Summary statistics of variables used to construct governance index

Following Bertrand and Mullainathan (2001), we construct the governance index using four governance variables: the number of blockholders, the number of blockholders on the board, (negative value of) board size, and board independence. A blockholder is defined as a shareholder who owns at least five percent of the common shares in the company. Shareholder ownership is collected from Capital IQ. *Board size* is the number of members of the board of directors. *Board Independence* is the percentage of independent directors on the board. Board directors' ownership, board size, and the percentage of independent directors on the board are obtained from GMI Ratings. Governance Index is the unweighted sum of the four standardized governance variables. The variables are standardized by demeaning each of the four variables and dividing by their respective standard deviations. These are then added to construct the governance index. Larger values for governance index capture stronger governance. The sample used to construct the index includes the 1,165 sample firms covered in GMI Ratings at fiscal year 2011. The calculation of Governance Index is based on unbalanced panel, so its mean is not zero.

	N	mean	median	std.
Number of blockholders (All)	1,020	3.335	3.000	1.686
Number of blockholders on board	1,117	0.239	0.000	0.566
Board size	1,158	9.544	9.000	2.377
Board independence	1,157	0.580	0.600	0.211
Governance Index	989	-0.032	-0.244	2.091

TABLE 1 Sample selection procedure

This table presents the sample selection for the analyses in various tables.

	Number of observations
Companies, non-for-profit organizations, and governments that are covered by PayScale.com (2011)	10,602
Companies that are available in Compustat	1,590
Companies that are available in GMI Ratings at fiscal year 2011	1,165
After dropping companies with missing CEO total compensations in Capital IQ	1,154
After dropping companies with missing median employee's compensation data at PayScale.com	<u>1,125</u>
After dropping companies with missing data to construct the governance index	965
The sample after dropping companies with missing financial or governance data (Tables 3, 4, 7, 8, and 9)	<u>817</u>
After merging the 965 firms with SDC acquisition data, there are 618 acquisition announcements in the year following the fiscal-year end of 2011	618
The sample after dropping companies with (1) transactions with the same acquirer and target name (i.e., share repurchases and self-tender offers); (2) the ratio of the transaction value relative to the market equity value of the bidder at the beginning of the announcement month being less than 5%; (3) CEO changes during 2012; and (4) missing financial or governance data (Table 5)	<u>105</u>
After dropping companies with missing variables from the 1,125 companies, the sample used in regressions in Table 6	<u>987</u>

TABLE 2 Descriptive Statistics

This table presents the descriptive statistics on variables for the 817 firms used in the analyses of firm value and firm performance. Note that Tobin's q, ROA, CEO pay ratio measures (*AverageRatio* and *EntryRatio*) are industry-adjusted in the regression analyses to facilitate across-industry comparison.

	N	Mean	Median	Std.
Tobin's q, $t+1$	817	1.731	1.411	0.941
ROA, $t+1$	817	0.043	0.044	0.078
CEO Total Compensation, t (in dollars)	817	7,780,000	5,820,000	8,540,000
Employee pay (Average), t (in dollars)	817	74,365	72,409	24,190
Employee pay (Entry), t (in dollars)	817	55,214	52,118	18,731
CEO pay ratio, t (AverageRatio)	817	103.2	78.8	84.2
CEO pay ratio, t (EntryRatio)	817	145.3	109.1	129.3
Ln(CEOComp), t	817	15.423	15.577	1.239
Ln Employee pay (Average), t	817	11.174	11.190	0.267
Ln Employee pay (Entry), t	817	10.872	10.861	0.290
CEO Pay Slice, t	817	0.390	0.394	0.115
Governance Index	817	-0.098	-0.266	2.082
Insider Ownership	817	0.112	0.032	0.195
Ln(Sales)	817	7.660	7.824	1.389
Tobin's q, t	817	1.722	1.403	0.972
ROA, t	817	0.052	0.049	0.074
Leverage	817	0.198	0.166	0.179
R&D	817	0.023	0.000	0.047
R&D Missing	817	0.436	0.000	0.496
Capital Expenditure	817	0.046	0.033	0.045
Firm Age	817	3.195	3.135	0.654
Business Segment Concentration	817	0.731	0.934	0.300
Market Share	817	0.025	0.007	0.049

TABLE 3 CEO Pay Ratio and Tobin's *q*

This table reports the OLS regression results of one-year-ahead industry-adjusted Tobin's *q* on CEO pay ratio and control variables. Please see Appendix A for variable definitions. Statistical significance of the reported coefficients is based on Huber-White robust standard errors. ***, **, and * represent significance at the 1, 5, and 10% levels, respectively. T-statistics are shown in parentheses.

Dependent variable:	Industry-adjusted Tobin's *q*, *t+1*	
	(1)	(2)
CEO pay ratio =	*AverageRatio*	*EntryRatio*
CEO pay ratio, t	0.047***	0.026**
	(2.66)	(2.52)
Industry-adjusted Tobin's q, t	0.881***	0.882***
	(29.31)	(29.34)
Industry-adjusted ROA, t	-0.064	-0.061
	(-0.23)	(-0.22)
CEO Pay Slice, t	-0.313**	-0.295**
	(-2.33)	(-2.22)
Governance Index	-0.001	-0.002
	(-0.16)	(-0.23)
Insider Ownership	0.514**	0.519**
	(2.09)	(2.10)
Insider Ownership²	-0.725**	-0.734**
	(-2.45)	(-2.46)
Ln(Sales)	0.001	0.000
	(0.13)	(0.05)
Leverage	0.162**	0.164**
	(2.44)	(2.47)
R&D	-0.738	-0.746
	(-1.46)	(-1.47)
R&D Missing	-0.019	-0.023
	(-0.68)	(-0.81)
Capital Expenditure	-0.264	-0.258
	(-1.02)	(-1.00)
Firm Age	0.035	0.036*
	(1.61)	(1.65)
Business Segment Concentration	0.018	0.020
	(0.46)	(0.50)
Market Share	-0.303*	-0.257
	(-1.78)	(-1.61)
Constant	-0.033	-0.038
	(-0.26)	(-0.31)
N	817	817
Adj. R²	80.58%	80.55%

TABLE 4 CEO Pay Ratio and ROA

This table reports the OLS regression results of one-year-ahead industry-adjusted ROA on CEO pay ratio and control variables. Please see Appendix A for variable definitions. Statistical significance of the reported coefficients is based on Huber-White robust standard errors. ***, **, and * represent significance at the 1, 5, and 10% levels, respectively. T-statistics are shown in parentheses.

Dependent variable:	Industry-adjusted ROA, t+1	
	(1)	(2)
CEO pay ratio =	*AverageRatio*	*EntryRatio*
CEO pay ratio, t	0.007***	0.005***
	(2.62)	(3.05)
Industry-adjusted Tobin's q, t	0.014***	0.014***
	(3.21)	(3.21)
Industry-adjusted ROA, t	0.671***	0.671***
	(8.62)	(8.61)
CEO Pay Slice, t	-0.022	-0.022
	(-0.99)	(-0.98)
Governance Index	0.003**	0.003**
	(2.04)	(2.05)
Insider Ownership	-0.010	-0.008
	(-0.22)	(-0.17)
Insider Ownership²	-0.020	-0.023
	(-0.30)	(-0.34)
Ln(Sales)	0.004*	0.004*
	(1.80)	(1.78)
Leverage	-0.005	-0.004
	(-0.33)	(-0.30)
R&D	-0.144	-0.144
	(-1.17)	(-1.17)
R&D Missing	-0.004	-0.005
	(-0.97)	(-1.09)
Capital Expenditure	-0.149***	-0.147***
	(-3.31)	(-3.24)
Firm Age	0.006*	0.006*
	(1.69)	(1.70)
Business Segment Concentration	0.011	0.012
	(1.44)	(1.49)
Market Share	-0.032	-0.030
	(-1.11)	(-1.06)
Constant	-0.039	-0.039*
	(-1.63)	(-1.65)
N	817	817
Adj. R²	47.49%	47.55%

TABLE 5 CEO Pay Ratio and Returns Surrounding Acquisition Announcements

This table reports OLS regression results on the relationship between CEO pay ratios and abnormal stock returns surrounding acquisition announcements. The dependent variable is the cumulative abnormal announcement return of the bidder in the three days around the announcement (CAR [-1, +1]). Please see Appendix A for variable definitions. Statistical significance of the reported coefficients is based on Huber-White robust standard errors. ***, **, and * represent significance at the 1, 5, and 10% levels, respectively. T-statistics are shown in parentheses.

Dependent variable:	CAR [-1, +1]	
	(1)	(2)
CEO pay ratio =	AverageRatio	EntryRatio
CEO pay ratio (Bidder)	0.049**	0.044**
	(2.02)	(2.59)
CEO Pay Slice (Bidder)	-0.134	-0.173**
	(-1.63)	(-2.10)
Governance Index (Bidder)	0.007	0.008*
	(1.49)	(1.74)
Ln(Sales) (Bidder)	-0.003	-0.003
	(-0.43)	(-0.39)
Tobin's q (Bidder)	0.007	0.005
	(0.57)	(0.39)
ROA (Bidder)	-0.297	-0.255
	(-1.54)	(-1.45)
Leverage (Bidder)	-0.024	-0.020
	(-0.43)	(-0.38)
R&D (Bidder)	-0.336	-0.320
	(-1.61)	(-1.49)
R&D Missing (Bidder)	-0.002	-0.001
	(-0.09)	(-0.07)
Capital Expenditure (Bidder)	0.163	0.127
	(0.47)	(0.37)
Firm Age (Bidder)	-0.005	-0.006
	(-0.24)	(-0.34)
Business Segment Concentration (Bidder)	-0.007	0.003
	(-0.24)	(0.11)
Market Share (Bidder)	-0.417	-0.510
	(-0.88)	(-1.10)
Prior RET (Bidder)	0.034	0.032
	(0.97)	(0.92)
Relative Deal Size	0.037	0.032
	(1.35)	(1.43)
Public (Target)	-0.023	-0.022
	(-1.18)	(-1.24)
Subsidiary (Target)	-0.019	-0.023
	(-1.26)	(-1.48)
Constant	0.220*	0.256*
	(1.70)	(1.94)
Industry indicators (Bidder)	Yes	Yes
N	105	105
Adj. R^2	0.11%	4.79%

TABLE 6 CEO Pay Ratio and Turnover-Performance Sensitivity

This table reports logit regression results on the relationship between CEO pay ratio and CEO turnover-performance sensitivity. The dependent variable *CEO Turnover* is an indicator that equals one if the CEO of the firm in year *t*+1 is not the same as in year *t*. Please see Appendix A for variable definitions. Statistical significance of the reported coefficients is based on Huber-White robust standard errors. ***, **, and * represent significance at the 1, 5, and 10% levels, respectively. Z-statistics are shown in parentheses.

Dependent variable:	CEO Turnover, *t*+1			
	(1)	(2)	(3)	(4)
CEO pay ratio =	*AverageRatio*	*EntryRatio*	*AverageRatio*	*EntryRatio*
CEO pay ratio, t	0.558**	0.345***	0.558**	0.373**
	(2.29)	(2.59)	(2.15)	(2.50)
RET, t	-9.156***	-8.823***		
	(-3.44)	(-3.36)		
RET, t × CEO pay ratio, t	-1.955***	-1.243***		
	(-2.78)	(-2.67)		
RET, t × CEO Pay Slice, t	15.730***	14.950***		
	(2.68)	(2.60)		
RET, t × Board Co-option	14.660**	13.900**		
	(2.57)	(2.32)		
RET, t × CEO Ownership	-21.720	-24.590		
	(-0.80)	(-0.87)		
RET, t × CEO/Chair Duality	0.766	0.922		
	(0.53)	(0.64)		
Firm-Specific RET, t			-11.740***	-11.390***
			(-3.28)	(-3.22)
Market RET, t			1.602	0.830
			(0.11)	(0.06)
Firm-Specific RET, t × CEO pay ratio, t			-2.392***	-1.532***
			(-3.31)	(-3.21)
Market RET, t × CEO pay ratio, t			-0.484	-0.832
			(-0.14)	(-0.47)
Firm-Specific RET, t × CEO Pay Slice, t			21.490***	20.680***
			(2.71)	(2.65)
Market RET, t × CEO Pay Slice, t			3.519	5.049
			(0.13)	(0.20)
Firm-Specific RET, t × Board Co-option			15.910**	15.350**
			(2.49)	(2.32)
Market RET, t × Board Co-option			-9.204	-9.370
			(-0.40)	(-0.43)
Firm-Specific RET, t × CEO Ownership			-20.590	-24.740
			(-0.76)	(-0.85)
Market RET, t × CEO Ownership			-342.300	-361.200
			(-0.92)	(-0.97)
Firm-Specific RET, t × CEO/Chair Duality			1.020	1.275
			(0.64)	(0.81)
Market RET, t × CEO/Chair Duality			5.837	6.411*
			(1.57)	(1.77)
CEO Pay Slice, t	-2.010	-1.857	-1.982	-1.945
	(-0.91)	(-0.87)	(-0.85)	(-0.85)
Board Co-option	-14.720***	-14.490***	-14.980***	-14.790***
	(-6.12)	(-6.09)	(-5.69)	(-5.66)

CEO Ownership	-26.950*	-27.270*	-24.810*	-24.970*
	(-1.82)	(-1.79)	(-1.86)	(-1.78)
CEO/Chair Duality	-0.862**	-0.885**	-0.913**	-0.973**
	(-2.22)	(-2.28)	(-2.20)	(-2.33)
CEO Age ≥ 60	0.961**	0.974**	0.947**	0.957**
	(2.44)	(2.52)	(2.35)	(2.42)
Constant	-3.132***	-2.989***	-3.156***	-2.957***
	(-2.74)	(-2.76)	(-2.66)	(-2.59)
CEO tenure and industry indicators	Yes	Yes	Yes	Yes
N	987	987	987	987
Pseudo R^2	57.60%	57.28%	58.75%	58.49%

TABLE 7 CEO Pay Ratio, Tobin's q, and ROA: Conditional on Governance Index

This table reports the OLS regression results of Tobin's *q* and ROA on CEO pay ratio and control variables. The dependent variable is one-year-ahead industry-adjusted Tobin's q in Columns (1) and (2) and one-year-ahead industry-adjusted ROA in Columns (3) and (4). Please see Appendix A for variable definitions. Statistical significance of the reported coefficients is based on Huber-White robust standard errors. ***, **, and * represent significance at the 1, 5, and 10% levels, respectively. T-statistics are shown in parentheses.

Dependent variable:	Industry-adjusted Tobin's q, $t+1$		Industry-adjusted ROA, $t+1$	
	(1)	(2)	(3)	(4)
CEO pay ratio =	AverageRatio	EntryRatio	AverageRatio	EntryRatio
CEO pay ratio, t	0.059***	0.033**	0.007**	0.005***
	(2.74)	(2.57)	(2.41)	(2.83)
CEO pay ratio, t × Governance Index	0.016*	0.009	-0.000	0.000
	(1.73)	(1.54)	(-0.12)	(0.31)
Industry-adjusted Tobin's q, t	0.879***	0.880***	0.014***	0.014***
	(28.94)	(29.07)	(3.20)	(3.19)
Industry-adjusted ROA, t	-0.059	-0.060	0.671***	0.671***
	(-0.21)	(-0.22)	(8.61)	(8.61)
CEO Pay Slice, t	-0.361**	-0.332**	-0.022	-0.023
	(-2.56)	(-2.39)	(-0.94)	(-1.01)
Governance Index	-0.003	-0.004	0.003**	0.003**
	(-0.42)	(-0.48)	(2.03)	(1.97)
Insider Ownership	0.548**	0.549**	-0.010	-0.007
	(2.23)	(2.22)	(-0.23)	(-0.15)
Insider Ownership^2	-0.766***	-0.768**	-0.019	-0.024
	(-2.59)	(-2.58)	(-0.29)	(-0.36)
Ln(Sales)	0.002	0.001	0.004*	0.004*
	(0.22)	(0.12)	(1.78)	(1.78)
Leverage	0.160**	0.161**	-0.005	-0.004
	(2.41)	(2.42)	(-0.33)	(-0.30)
R&D	-0.703	-0.718	-0.144	-0.143
	(-1.40)	(-1.42)	(-1.17)	(-1.16)
R&D Missing	-0.016	-0.020	-0.004	-0.005
	(-0.57)	(-0.72)	(-0.97)	(-1.07)
Capital Expenditure	-0.245	-0.233	-0.150***	-0.146***
	(-0.95)	(-0.90)	(-3.32)	(-3.23)
Firm Age	0.037*	0.038*	0.006*	0.006*
	(1.68)	(1.74)	(1.68)	(1.71)
Business Segment Concentration	0.022	0.022	0.011	0.012
	(0.55)	(0.57)	(1.43)	(1.49)
Market Share	-0.280	-0.248	-0.032	-0.029
	(-1.64)	(-1.54)	(-1.13)	(-1.05)
Constant	-0.027	-0.036	-0.039	-0.039*
	(-0.22)	(-0.29)	(-1.64)	(-1.65)
N	817	817	817	817
Adj. R^2	80.64%	80.59%	47.43%	47.49%

TABLE 8 Controlling for CEO and Employee Compensation Levels and CEO Compensation Structure

This table reports the OLS regression results of Tobin's *q* and ROA on CEO pay ratio and control variables after controlling for the level of CEO and employee compensation (Panel A) and the CEO compensation structure (Panel B). For each panel, the dependent variable is one-year-ahead industry-adjusted Tobin's *q* in Columns (1) and (2) and one-year-ahead industry-adjusted ROA in Columns (3) and (4). For Panel B, the CEO compensation structure is measured as the stock-based compensation ratio (i.e., the grant date fair value of stock and option awards, divided by total compensation). Stock-based compensation data are collected from Capital IQ. Please see Appendix A for variable definitions. Statistical significance of the reported coefficients is based on Huber-White robust standard errors. ***, **, and * represent significance at the 1, 5, and 10% levels, respectively. T-statistics are shown in parentheses.

Panel A: Controlling for CEO and employee compensation level

Dependent Variable:	Industry-adjusted Tobin's *q*, t+1		Industry-adjusted ROA, t+1	
	(1)	(2)	(3)	(4)
CEO pay ratio =	*AverageRatio*	*EntryRatio*	*AverageRatio*	*EntryRatio*
CEO pay ratio, t	0.032*	0.020*	0.007**	0.004**
	(1.70)	(1.76)	(2.03)	(2.27)
Ln(CEOComp)	0.024**	0.027**	0.001	0.002
	(1.97)	(2.22)	(0.65)	(0.84)
Ln(EmployeeComp) (Average)	0.076		0.015	
	(1.13)		(1.36)	
Ln(EmployeeComp) (Entry)		0.066		0.005
		(1.28)		(0.50)
Industry-adjusted Tobin's q, t	0.883***	0.883***	0.014***	0.014***
	(29.48)	(29.47)	(3.29)	(3.24)
Industry-adjusted ROA, t	-0.079	-0.080	0.669***	0.670***
	(-0.29)	(-0.29)	(8.68)	(8.64)
CEO Pay Slice, t	-0.383***	-0.391***	-0.026	-0.029
	(-2.70)	(-2.78)	(-1.06)	(-1.20)
Governance Index	0.000	0.000	0.003**	0.003**
	(0.07)	(0.01)	(2.20)	(2.18)
Insider Ownership	0.621**	0.613**	0.003	-0.001
	(2.45)	(2.44)	(0.06)	(-0.02)
Insider Ownership²	-0.830***	-0.821***	-0.033	-0.029
	(-2.74)	(-2.73)	(-0.49)	(-0.44)
Ln(Sales)	-0.004	-0.004	0.003	0.004
	(-0.52)	(-0.52)	(1.34)	(1.54)
Leverage	0.147**	0.149**	-0.006	-0.005
	(2.23)	(2.24)	(-0.44)	(-0.38)
R&D	-0.913*	-0.878	-0.178	-0.153
	(-1.67)	(-1.65)	(-1.33)	(-1.19)
R&D Missing	-0.020	-0.020	-0.005	-0.005
	(-0.72)	(-0.72)	(-1.02)	(-1.04)
Capital Expenditure	-0.284	-0.306	-0.151***	-0.151***
	(-1.10)	(-1.16)	(-3.30)	(-3.30)
Firm Age	0.035	0.034	0.006*	0.006*
	(1.57)	(1.56)	(1.78)	(1.67)
Business Segment Concentration	0.031	0.029	0.013*	0.012
	(0.78)	(0.73)	(1.69)	(1.58)
Market Share	-0.346**	-0.339**	-0.039	-0.035
	(-2.00)	(-2.04)	(-1.32)	(-1.23)
Constant	-1.187	-1.088*	-0.219**	-0.115
	(-1.60)	(-1.91)	(-2.04)	(-1.26)

46

	817	817	817	817
N				
Adj. R^2	80.65%	80.64%	47.55%	47.48%

TABLE 8 (Cont'd)

Panel B: Controlling for CEO compensation structure

Dependent Variable:	Industry-adjusted Tobin's q, t+1		Industry-adjusted ROA, t+1	
	(1)	(2)	(3)	(4)
CEO pay ratio =	*AverageRatio*	*EntryRatio*	*AverageRatio*	*EntryRatio*
CEO pay ratio, t	0.046**	0.025**	0.008***	0.005***
	(2.53)	(2.39)	(2.86)	(3.17)
CEO Stock Compensation Ratio, t	0.017	0.022	-0.017*	-0.016*
	(0.30)	(0.38)	(-1.68)	(-1.65)
Industry-adjusted Tobin's q, t	0.882***	0.883***	0.014***	0.014***
	(29.17)	(29.20)	(3.20)	(3.20)
Industry-adjusted ROA, t	-0.085	-0.081	0.670***	0.671***
	(-0.31)	(-0.29)	(8.47)	(8.46)
CEO Pay Slice, t	-0.312**	-0.296**	-0.013	-0.013
	(-2.30)	(-2.19)	(-0.60)	(-0.57)
Governance Index	-0.001	-0.002	0.003**	0.003**
	(-0.17)	(-0.24)	(2.07)	(2.07)
Insider Ownership	0.518**	0.526**	-0.020	-0.017
	(2.16)	(2.19)	(-0.43)	(-0.38)
Insider Ownership^2	-0.730**	-0.740**	-0.011	-0.014
	(-2.52)	(-2.54)	(-0.17)	(-0.22)
Ln(Sales)	0.001	-0.000	0.004*	0.004*
	(0.07)	(-0.02)	(1.88)	(1.86)
Leverage	0.160**	0.161**	-0.004	-0.003
	(2.40)	(2.42)	(-0.25)	(-0.22)
R&D	-0.710	-0.722	-0.127	-0.127
	(-1.38)	(-1.40)	(-1.01)	(-1.01)
R&D Missing	-0.019	-0.023	-0.004	-0.005
	(-0.68)	(-0.80)	(-0.98)	(-1.11)
Capital Expenditure	-0.279	-0.273	-0.147***	-0.145***
	(-1.07)	(-1.05)	(-3.27)	(-3.18)
Firm Age	0.034	0.035	0.006	0.006
	(1.57)	(1.61)	(1.52)	(1.54)
Business Segment Concentration	0.019	0.021	0.011	0.012
	(0.48)	(0.52)	(1.49)	(1.53)
Market Share	-0.306*	-0.261	-0.032	-0.028
	(-1.79)	(-1.63)	(-1.12)	(-1.02)
Constant	-0.034	-0.040	-0.035	-0.036
	(-0.27)	(-0.32)	(-1.52)	(-1.54)
N	812	812	812	812
Adj. R^2	80.55%	80.53%	47.68%	47.72%

TABLE 9 CEO Pay Ratio and Firm Value/Performance: The Nonlinearity

This table reports the OLS regression results of Tobin's q and ROA on CEO pay ratio and control variables after including the squared term of CEO pay ratio. The dependent variable is one-year-ahead industry-adjusted Tobin's q in Columns (1) and (2) and one-year-ahead industry-adjusted ROA in Columns (3) and (4). Please see Appendix A for variable definitions. Statistical significance of the reported coefficients is based on Huber-White robust standard errors. ***, **, and * represent significance at the 1, 5, and 10% levels, respectively. T-statistics are shown in parentheses.

Dependent Variable:	Industry-adjusted Tobin's q, t+1		Industry-adjusted ROA, t+1	
	(1)	(2)	(3)	(4)
CEO pay ratio =	AverageRatio	EntryRatio	AverageRatio	EntryRatio
CEO pay ratio, t	0.065*	0.043*	0.016**	0.011***
	(1.80)	(1.78)	(2.56)	(2.78)
CEO pay ratio^2, t	-0.010	-0.004	-0.005*	-0.002**
	(-0.75)	(-0.94)	(-1.95)	(-2.11)
Industry-adjusted Tobin's q, t	0.880***	0.881***	0.013***	0.013***
	(29.25)	(29.25)	(3.17)	(3.16)
Industry-adjusted ROA, t	-0.064	-0.061	0.671***	0.671***
	(-0.23)	(-0.22)	(8.69)	(8.68)
CEO Pay Slice, t	-0.328**	-0.317**	-0.029	-0.030
	(-2.38)	(-2.31)	(-1.27)	(-1.29)
Governance Index	-0.001	-0.001	0.003**	0.003**
	(-0.10)	(-0.10)	(2.20)	(2.27)
Insider Ownership	0.533**	0.535**	-0.001	-0.002
	(2.18)	(2.18)	(-0.01)	(-0.04)
Insider Ownership^2	-0.743**	-0.742**	-0.028	-0.026
	(-2.53)	(-2.52)	(-0.42)	(-0.38)
Ln(Sales)	0.002	0.001	0.005*	0.005*
	(0.20)	(0.20)	(1.91)	(1.94)
Leverage	0.162**	0.165**	-0.004	-0.004
	(2.45)	(2.48)	(-0.32)	(-0.29)
R&D	-0.735	-0.743	-0.142	-0.143
	(-1.46)	(-1.47)	(-1.17)	(-1.17)
R&D Missing	-0.019	-0.023	-0.004	-0.005
	(-0.68)	(-0.81)	(-0.97)	(-1.10)
Capital Expenditure	-0.248	-0.237	-0.142***	-0.140***
	(-0.96)	(-0.92)	(-3.17)	(-3.10)
Firm Age	0.034	0.035	0.006	0.006
	(1.56)	(1.59)	(1.57)	(1.59)
Business Segment Concentration	0.020	0.022	0.012	0.012
	(0.50)	(0.56)	(1.54)	(1.60)
Market Share	-0.288*	-0.279*	-0.025	-0.037
	(-1.68)	(-1.70)	(-0.88)	(-1.29)
Constant	-0.030	-0.037	-0.038	-0.039
	(-0.24)	(-0.30)	(-1.57)	(-1.63)
N	817	817	817	817
Adj. R^2	80.56%	80.55%	47.68%	47.75%

TABLE 10 Top 4 Executive Pay Ratio and Firm Value/Performance

This table reports the OLS regression results of Tobin's q and ROA on top 4 executive pay ratio and control variables. The dependent variable is one-year-ahead industry-adjusted Tobin's q in Columns (1) and (2) and one-year-ahead industry-adjusted ROA in Columns (3) and (4). Please see Appendix A for variable definitions. Statistical significance of the reported coefficients is based on Huber-White robust standard errors. ***, **, and * represent significance at the 1, 5, and 10% levels, respectively. T-statistics are shown in parentheses.

Dependent Variable:	Industry-adjusted Tobin's q, t+1		Industry-adjusted ROA, t+1	
	(1)	(2)	(3)	(4)
Top 4 Pay Ratio =	*AverageRatio*	*EntryRatio*	*AverageRatio*	*EntryRatio*
Top 4 Pay Ratio, t	0.019*	0.012*	0.004**	0.002**
	(1.69)	(1.70)	(2.04)	(2.39)
Industry-adjusted Tobin's q, t	0.883***	0.883***	0.014***	0.014***
	(29.45)	(29.46)	(3.25)	(3.26)
Industry-adjusted ROA, t	-0.074	-0.073	0.669***	0.669***
	(-0.27)	(-0.26)	(8.57)	(8.56)
CEO Pay Slice, t	-0.161	-0.167	0.002	0.002
	(-1.24)	(-1.30)	(0.12)	(0.08)
Governance Index	-0.002	-0.002	0.003**	0.003**
	(-0.31)	(-0.32)	(2.01)	(2.00)
Insider Ownership	0.518**	0.517**	-0.008	-0.008
	(2.11)	(2.10)	(-0.17)	(-0.16)
Insider Ownership^2	-0.726**	-0.728**	-0.022	-0.023
	(-2.46)	(-2.46)	(-0.32)	(-0.34)
Ln(Sales)	-0.000	-0.000	0.004*	0.004*
	(-0.01)	(-0.02)	(1.75)	(1.75)
Leverage	0.158**	0.159**	-0.005	-0.005
	(2.38)	(2.39)	(-0.38)	(-0.36)
R&D	-0.758	-0.758	-0.146	-0.146
	(-1.49)	(-1.49)	(-1.18)	(-1.18)
R&D Missing	-0.021	-0.022	-0.004	-0.005
	(-0.72)	(-0.77)	(-0.99)	(-1.04)
Capital Expenditure	-0.277	-0.273	-0.150***	-0.150***
	(-1.07)	(-1.05)	(-3.33)	(-3.30)
Firm Age	0.035	0.035	0.006*	0.006*
	(1.60)	(1.62)	(1.66)	(1.67)
Business Segment Concentration	0.017	0.018	0.011	0.011
	(0.44)	(0.46)	(1.43)	(1.45)
Market Share	-0.231	-0.215	-0.025	-0.023
	(-1.46)	(-1.41)	(-0.89)	(-0.84)
Constant	-0.078	-0.078	-0.047*	-0.047*
	(-0.63)	(-0.63)	(-1.92)	(-1.93)
N	817	817	817	817
Adj. R^2	80.49%	80.49%	47.36%	47.39%