

# UC Irvine

## UC Irvine Electronic Theses and Dissertations

### Title

The Consequences of Pay Dispersion on Employee Perceptions and Productivity

### Permalink

<https://escholarship.org/uc/item/09w889t0>

### Author

Bailey-Rihawi, Esther Elizabeth

### Publication Date

2019

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA,  
IRVINE

The Consequences of Pay Dispersion on Employee Perceptions and Productivity

DISSERTATION

submitted in partial satisfaction of the requirements  
for the degree of

DOCTOR OF PHILOSOPHY

in Management

by

Esther Elizabeth Bailey-Rihawi

Dissertation Committee:  
Professor Terrence Shevlin, Chair  
Professor Jone Pearce  
Professor John Duffy  
Professor Morton Pincus  
Professor Elizabeth Chuk

2019

© 2019 Esther Elizabeth Bailey-Rihawi

## DEDICATION

To

my family, by blood and by love, especially,  
my mother, a.k.a. Nonna,  
my sister, Anna,  
my daughter, Katarina,  
my co-parent, Sammy,  
my husband, Kalen, and  
my new children, Louis and Genevieve

in loving memory of Professor Michael “Andy” Andrew Little;

with thanks to the guiding power of the Holy Spirit

“The limit of poverty shall be the value of the allotment... And having set this as the inferior limit, the lawgiver shall allow a man to possess twice this amount, or three times, or four times...if he makes the surplus over to the State and the gods who keep the State, he shall be well-esteemed and free from penalty...All the property of every man over and above his allotment shall be publicly written out and be in the keeping of the magistrates appointed by law...”

Plato (trans. R. G. Bury)  
*Laws*, V, 744d-745a

## TABLE OF CONTENTS

	Page
LIST OF FIGURES	iv
LIST OF TABLES	v
ACKNOWLEDGMENTS	vi
CURRICULUM VITAE	vii
ABSTRACT OF THE DISSERTATION	viii
I. INTRODUCTION	1
II. PRIOR LITERATURE AND HYPOTHESES	11
III. RESEARCH DESIGN	26
IV. EMPIRICAL ANALYSIS	38
V. CONCLUSION	57
REFERENCES	60
APPENDIX A: GLASSDOOR.COM SCREENSHOTS	61
APPENDIX B: PAYSACLE.COM SCREENSHOT	62
APPENDIX C: VARIABLE DEFINITIONS	63

## LIST OF FIGURES

	Page
Figure 1: Pathway linking the Pay Ratio Disclosure to capital market reactions via employees	11
Figure 2: Summary of Contemporary Accounting Literature with respect to the pathway	16

## LIST OF TABLES

	Page
Table 1: Sample Selection Procedures	27
Table 2: Descriptive Statistics	39
Table 3: Overall Employee Perceptions, Productivity and the Pay Ratio	41
Table 4: Moderating Effect of Pay for Performance	45
Table 5: Relative Information Content of Pay Ratio Disclosure Components	49
Table 6: Incremental Information Content of Pay Ratio Disclosure Components	52
Table 7: Individual Ratings around the Pay Ratio Disclosure	56

## ACKNOWLEDGMENTS

I owe a debt of gratitude to my entire dissertation committee. Thank you all for your willingness to go beyond the bounds of each discipline and outside the areas you each specialize in to help me build more bridges between the world of accounting research and the economics and management literature. Most importantly, thank you for your guidance as I learned to navigate the world of academic research.

Thank you Terry Shevlin for graciously chairing my dissertation committee and generously contributing funds for the manual data collection required for this dissertation. You are a good and brave man for taking on such an adventurous advisee.

Thank you Mort Pincus, for your consistent encouragement. I admire the breadth of research you have done in your career and I am so grateful you were one of my guides as I first ventured into the world of research.

Thank you Liz Chuk, for mentoring me. I am deeply appreciative of your patience and feedback as I learn to be a better researcher and co-author.

Thank you Jone Pearce, for being my role model and helping me understand the importance of working across different disciplines and the potential of different methodologies.

Thank you John Duffy, for persisting with me as this dissertation morphed from an experimental economics based lab experiment to an empirical work. I hope one day to publish an experiment that will make you proud.

Thank you to Tiana Lehmer for being the best cohort-mate anyone could ever hope for. There are few people in this world with your level of intelligence, integrity and kindness.

Thank you Aruhn Venkat for always taking the time to talk, for being a sounding board and for your helpful insights.

Thank you Eric Floyd for being my academic big brother and always having my back.

Thank you Jeanette Chan He for excellent data collection assistance. You are incredibly bright and I look forward to seeing where you will go in your career.

Thank you to Jonathan Cervas for assistance with coding, for helpful comments and for your friendship.

Thank you to former U.S. House of Representatives member, John Campbell III, who provided insights about the Congressional process involved in the passage of the Pay Ratio Disclosure rule and informed my understanding of the political context of the disclosure.

The analysis performed would not have been possible without PayScale.com who provided pay-for-performance data and Glassdoor.com who granted me access to their API.



## **CURRICULUM VITAE**

### **Esther Elizabeth Bailey-Rihawi, CPA (Inactive)**

2009	B.B.A. in Accounting, University of Houston
2010	M.S. in Accountancy, University of Houston
2010-11	Protiviti Consulting, Houston, Texas
2011-12	Khudairi Group, Dubai, United Arab Emirates
2012-13	SURE Program, University of Houston
2019	Ph.D. in Management, University of California, Irvine

### **FIELD OF STUDY**

Employee compensation practices and Entrepreneurship, in particular credit access

# **ABSTRACT OF THE DISSERTATION**

The Consequences of Pay Dispersion on Employee Perceptions and Productivity

By

Esther Elizabeth Bailey-Rihawi

Doctor of Philosophy in Management

University of California, Irvine, 2019

Professor Terrence Shevlin, Chair

The recent Pay Ratio Disclosure mandated by the SEC under the Dodd-Frank Act requires the calculation of the ratio of total annual compensation of the CEO to the total annual compensation of the median rank-and-file employee. The Pay Ratio disclosure is a novel source of information about firm-level vertical pay dispersion. Contemporaneous research on pay dispersion evaluates the direct relationship between pay dispersion and future firm performance or capital market reactions. This paper contributes to the literature by investigating whether employee perceptions are a potential pathway for the relationship between pay dispersion and firm performance. I find that high levels of vertical pay dispersion within a firm are negatively associated with employee perceptions of a firm and labor productivity. I find that higher performance-based variable compensation moderates the negative perceptions and reduced labor productivity associated with high levels of vertical pay dispersion. I also find support for the hypothesis that the Pay Ratio Disclosure is incrementally (and in some cases relatively) more informative than existing disclosures about Executive Compensation with respect to employees and therefore also for researchers interested in the effects of pay dispersion on employees.

## **I. INTRODUCTION**

The Pay Ratio Disclosure is the first mandatory disclosure of intra-firm vertical pay dispersion for U.S. publicly traded firms. The Pay Ratio Disclosure contains three quantitative elements: the total annual compensation of the Chief Executive Officer, the total annual compensation of the median employee, and the ratio of CEO compensation to median employee compensation (this last element of the disclosure is hereafter referred to simply as the Pay Ratio) in the firm's annual proxy statement. For example, at the transportation company Ryder Systems the CEO's annual total compensation for 2017 was \$6,137,757 and the median employee's total annual compensation was \$44,344 resulting in a Pay Ratio of 138.

Generally speaking, pay dispersion is simply the difference in pay between individuals. The concept of pay dispersion goes by a variety of different labels in the literature of different disciplines. Pay dispersion is also called income inequality, pay equity, etc. Pay dispersion has historically been and continues to be an important social, economic and political issue. The Pay Ratio Disclosure is a measure of vertical pay dispersion, capturing the difference in pay between individuals at different levels within a firm.

The main objective of this paper is to evaluate the role of the employee in the relationship between the level of vertical pay dispersion and future firm performance. The Pay Ratio Disclosure, a measure of vertical pay dispersion, was a highly debated disclosure and generated abnormally high attention from interested parties during the Securities and Exchange Commission (SEC) standard setting process. Comment letters to the SEC provide insights into investors' interest in the Pay Ratio Disclosure. One of the twelve main types of

form letters submitted to the SEC in support of the Pay Ratio Disclosure, Letter Type D, which was submitted 5,433 times, asserts that the Pay Ratio Disclosure may be material to investors because “high CEO-to-worker pay ratios can have a negative impact on employee morale and productivity” (SEC 2018). In the most closely related piece of contemporaneous literature, Rouen (2019) claims that “pay disparity matters to employee satisfaction, with consequences for firm performance.” This claim in Rouen’s (2019) paper implies that understanding employee perceptions is crucial to understanding the relation between the Pay Ratio and future firm performance. I propose the following pathway between the level of pay dispersion and future firm performance as well as associated capital market reactions via employees:

1. The level of vertical pay dispersion in a company is known by employees.
2. Employees’ perceptions of the firm are impacted by the level of vertical pay dispersion.
3. Employees’ perceptions of the firm are demonstrated through observable expressions, through job performance, or both.
4. Firm-level productivity is impacted as a result of the aggregation of employee job performance.
5. Future firm performance is affected by employee productivity.
6. Capital market participants respond to anticipated changes in future firm performance.

The first step in the proposed pathway is that the level of vertical pay dispersion is known by employees. Measures of vertical pay dispersion, as opposed to overall or horizontal dispersion, measure the relative compensation of people in two different

positions in the firm hierarchy. Measures of vertical pay dispersion can capture differences for any degree of separation. Prior literature in economics, in particular experimental studies, focus on small degrees of separation, for example, an employee and their immediate supervisor. In the case of the Pay Ratio Disclosure these two positions are the Chief Executive Officer, who is nearly always the highest paid person in the firm, and the median employee, who is a member of the population of rank and file employees.

The economic phenomenon of vertical pay dispersion within a firm may be relevant to a number of different stakeholders including, but not limited to, shareholders, debt holders, policy makers and rank-and-file employees. In a deviation from most prior accounting research that generally focuses predominantly or exclusively on relevance of financial statements and disclosures to shareholders or debtholders, rank-and-file employees are the user group of interest in this study.

Understanding the origin of the Pay Ratio Disclosure provides insight into why employees are potentially a relevant user group. The financial accounting standards promulgated by Financial Accounting Standards Board (FASB) generally focus on use by investors and creditors. The standard setting process for the Pay Ratio Disclosure circumvented the usual process for evaluation of a financial accounting standard set by FASB because the requirement was set forth by Congress in the Dodd-Frank Act and was then enacted directly by the SEC. Due to the fact that the Pay Ratio Disclosure rule was not set by the FASB, the traditional group of users of the financial statements, namely investors and creditors, might not be the main or the only intended audience for this disclosure.

During the legislative process, Congress might have had different intended audiences for this disclosure, for example employees, labor unions and the general public.<sup>1</sup>

The disclosures mandated by the Dodd-Frank Act were written in a time of heightened political attention to pay inequity, contemporaneous to the Occupy Wall Street movement. The Dodd-Frank Act was largely a product of Democratic Party members who were more responsive to the demands of popular movements requesting more information about pay dispersion. The Pay Ratio Disclosure and other disclosures mandated under the Dodd-Frank Act represent a new class of disclosures with content that is not typical of traditional financial reporting and may expand the groups of intended users of financial reports beyond the intended groups of users under FASB's directive.

For the remainder of the paper employees are assumed to be a relevant user group for the Pay Ratio Disclosure. The implementation of the Pay Ratio Disclosure is the motivating event for this study and therefore the Pay Ratio as disclosed is the key quantitative measure of pay dispersion used in the analysis in this study. I do not assume that the Pay Ratio Disclosure in the proxy statement is the only way employees can learn about the level of vertical pay dispersion within the company they work for. Employees have had access to levels of executive compensation through existing disclosures in quarterly and annual filings as well as public lists and media mentions of CEO compensation. Existing disclosures of Executive Compensation allow for employees to estimate with some degree of accuracy the level of vertical pay dispersion within the

---

<sup>1</sup> The Pay Ratio Disclosure was added in a late draft of the Dodd-Frank Act and was not discussed in public Congressional sessions, therefore the intent of the disclosure and intended users were not clearly defined at the time the law was passed and have been inferred ex post based on commentary from Congress persons and speculation by potential users during the SEC enactment of the rule.

company they work for. Therefore the Pay Ratio Disclosure may serve as either a confirmatory source of information about the level of pay dispersion or as a source of novel information for employees who had inaccurately estimated the level of pay dispersion or who previously had no estimation of the level of pay dispersion.

According to the FASB definition of relevance, information is relevant if it “is capable of making a difference in the decisions made by users” (FASB, p.17).<sup>2</sup> Relevance of the Pay Ratio Disclosure to employees was not assessed by Congress or the SEC before implementation of the disclosure. The lack of ex ante assessment of the relevance of the measure serves as motivation for an ex post analysis, in particular because a new, non-traditional group of users has been identified. In order to measure the relevance of a particular piece of information a setting where the information might be decision relevant must be identified. The key economic resource employees have is their labor, a resource they have sole discretion over providing. Information is relevant to employees if it impacts their provision of labor. Assuming that the employees’ utility model contains some element related to pay comparisons, an assumption presented in a variety of employee utility models in the economics literature, then employees may experience positive or negative utility in response to observed pay dispersion. Utility is the way the employee responses are modeled in the economic literature, but this translates more generally to the way that

---

<sup>2</sup> It is important to note that employees need not react directly to the Pay Ratio Disclosure for the disclosure to be deemed relevant to employees. Under the definition of relevance provided by the FASB “information may be capable of making a difference in a decision even if some users choose not to take advantage of it or already are aware of it from other sources” (FASB, p.17). In the event that the employee has developed an understanding of the degree of pay dispersion through informal channels, for example water cooler conversations or the media, the Pay Ratio is still a relevant measure to that employee if it were to confirm their existing estimate of pay dispersion or provide new information that would impact their perceptions.

employees perceive the company, for example if there is a negative coefficient on vertical pay dispersion in the employees' utility model this translates to employees' having more negative perceptions of the firms with high levels of vertical pay dispersion.

In general, employees' perceptions of the firm are unobservable. Employees may share their perceptions of the company in an informal setting with a family member, friend or co-worker, but even these outward expressions of perceptions are unobservable to researchers. Fortunately, with the expansion of online job hunting a variety of websites, particularly Glassdoor, now serve as platforms where current and former employees of a company can express their perceptions of the firm in an anonymous review. For the analysis performed in this study observable employee expressions of their perceptions of the company are determined using quantitative ratings, specifically how the employee rates the firm on a scale of one to five with respect to compensation and benefits practices.

In addition to employees' expressions of perceptions in reviews of the firm another, arguably more important, expression of perceptions is through employees' job performance. Job performance is comprised of many different facets of employee behavior including elements like choice of effort level, task prioritization and problem solving that an employee might consciously or unconsciously alter in response to their perceptions of the company. Many companies develop internal measures of employee job performance, but information related to individual employee job performance is generally held in proprietary data sets. Therefore, in place of employee-level job performance, I focus on firm-level productivity as an aggregate measure of job performance of all employees.

The majority of the analyses performed in this paper are tests of the first three steps in the pathway between the Pay Ratio Disclosure and capital market reactions. The first set



of analyses is descriptive of the overall relationship between the level of vertical pay dispersion and expressions of employee perceptions –through online ratings of the company or firm-level productivity, a measure of aggregate employee job performance.

Before the Pay Ratio Disclosure went into effect employees may have developed estimates of the level of pay dispersion within the firm they work for. They may have developed estimates of the level of vertical pay dispersion based on a comparison of their own compensation with publicly available information about executive compensation, through conversations with co-workers about general compensation practices at the firm, or any other means. Regardless of the source of the information, employees are assumed to have some, potentially inaccurate, estimate of vertical pay dispersion. The Pay Ratio was first disclosed for firm year ends after December 15, 2017, is measured in the last three months of the firm fiscal year and appears in the proxy statements for December 31<sup>st</sup> year end firms in releases between February and April 2018.

The first set of tests I perform are association tests of the Pay Ratio as disclosed with measures of employee perceptions and productivity. The measure of employee perceptions is a historical measure of employee perceptions of the firm based on average ratings of the firm from 2009 or the firm’s first rating on Glassdoor, whichever is later, through the measurement period for the Pay Ratio in the last three months of fiscal year 2017 and up until April 2018.<sup>3</sup> The measures of employee productivity is based on the Net Income for

---

<sup>3</sup> At December 31<sup>st</sup>, 2017 the average compensation and benefits rating was obtained from Glassdoor for the 10,000 companies with the greatest number of reviews. This initial download included 1,127 companies from the final sample of 1,814 firms. Data collection related to the Pay Ratio Disclosure and the finalization of the sample was not complete until April 2018. On April 18, 2018 the average compensation and benefits rating was obtained for a larger sample of firms including 1,692 firms from the sample of 1,814 firms. This expanded the number of firms with compensation and benefits ratings for the overall perception measure by 565 observations. An analysis of the changes for the 1,127 firms for which data was collected on December 31<sup>st</sup>, 2017 and April 18, 2018 reveals

the firm in fiscal year 2017 divided by the number of employees, roughly contemporaneous to the measure of the Pay Ratio which must be measured for the company's choice of day in the last three months of the fiscal year.

The Pay Ratio as disclosed was not public until after earnings season in 2018 when proxy statements for firm year ends after December 31<sup>st</sup>, 2017 were released. The sample is comprised of firms who released a proxy statement by April 30<sup>th</sup>, 2018 and is therefore largely comprised of December 31<sup>st</sup>, 2017 year end firms. In the association tests performed the Pay Ratio serves as a measure of the level of vertical pay dispersion, which was not known to employees for the vast majority of the time covered by the overall perceptions measure and not known to employees for the time covered by the productivity measure. The assumption is that employees have developed estimates of the level of vertical pay dispersion in their firm. The association tests are not intended to measure the reaction to the Pay Ratio Disclosure, rather the Pay Ratio serves as a proxy for the level of vertical pay dispersion estimated by employees in the association tests. My second set of analyses examine employee reactions.

Testing the relationship between the Pay Ratio and employee perceptions serves as a joint test of whether the Pay Ratio as mandated is a faithful representation of vertical pay dispersion and whether vertical pay dispersion is relevant to employees' perceptions of the firm. Similarly, testing the relationship between the Pay Ratio and firm-level productivity is

---

that the median number of additional reviews per company was 24, a median (mean) of 5.5% (6.7%) of the total reviews on December 31<sup>st</sup>, 2017. Of the 1,127 firms, 524 firms had no change in the average compensation and benefits rating and the average change in the 5-point rating was 0.0006. In the association tests the perceptions measure is based on the ratings obtained on April 18, 2018. Although the main objective of the association test is to assess the overall association between perceptions and vertical pay dispersion and not to measure employee reactions to the Pay Ratio Disclosure itself, the inclusion of ratings posted after the Pay Ratio is released does not undermine the test of the association.

a joint test of whether the Pay Ratio is a faithful representation of vertical pay dispersion, whether vertical pay dispersion is relevant to employees and whether employees' perceptions affect their job performance. I perform tests of the association between the Pay Ratio and measures of aggregate ratings and firm-level productivity.

I find that high levels of the Pay Ratio are associated with lower aggregate employee ratings of firms' compensation and benefits practices in a sample of 1,052 publicly traded firms. Similarly, I find that high levels of the Pay Ratio are associated with lower firm-level productivity in a sample of 584 firms even after controlling for other drivers of productivity such as asset base, industry and capital expenditures. These findings are broadly consistent with the concept of Equity Theory and imply that employees believe high levels of vertical dispersion are unfair which drives a more negative perception of the firm and worse job performance.

In the subsequent analyses, the effect of pay-for-performance as a moderator is assessed. Data from PayScale.com on the amount of variable compensation employees receive is used as the proxy for pay-for-performance. For a given level of pay dispersion, higher pay-for-performance is associated with more positive employee perceptions of the firm and better overall job performance.

Additionally in these association tests, I evaluate whether the novel components of the Pay Ratio Disclosure - level of median employee compensation or the Pay Ratio - are relatively or incrementally informative over existing disclosures of Executive Compensation with respect to employee perceptions. I find that the novel elements of the Pay Ratio Disclosure are incrementally informative over existing disclosures of Executive

Compensation, and relatively more informative in the case of the level of median employee compensation.

I evaluate the Pay Ratio Disclosure's information content for employees. Leveraging the new mandatory disclosure as a context for performing a difference-in-difference test, I find evidence of a negative employee reaction to high levels of the Pay Ratio in three out of the four cases tested. The negative observed reaction is consistent with the Pay Ratio Disclosure being relevant new information to employees. Combined with the findings from the association tests that high levels of pay dispersion are negatively associated with productivity levels at a firm, information about the level of vertical pay dispersion in a firm plausibly contains information about future firm performance.

This paper contributes to contemporaneous literature which investigates the relationship between the level of vertical pay dispersion and future firm performance by highlighting the role of the employee as an agent affecting firm performance. These findings imply that the Pay Ratio Disclosure is relevant to employees, the user group of interest in this paper, but also shareholders by virtue of the information about future firm performance that may be gleaned from anticipated employee perceptions of vertical pay dispersion. The remainder of the paper is organized as follows. Section II contains a discussion of prior and contemporaneous literature and hypothesis development. In Section III I describe the research design and present the empirical results in Section IV. I conclude in Section V.

## II. PRIOR LITERATURE AND HYPOTHESES

### 2.1 Introduction to Prior Literature

The objective of this paper with respect to prior literature is two-fold. The first is to develop a pathway as a framework for understanding whether and why the Pay Ratio Disclosure, or other measures of vertical pay dispersion, are associated with future firm performance and capital market reactions. The proposed pathway highlights the role of employee perceptions and job performance as the mechanism by which vertical pay dispersion might be associated with future firm performance.

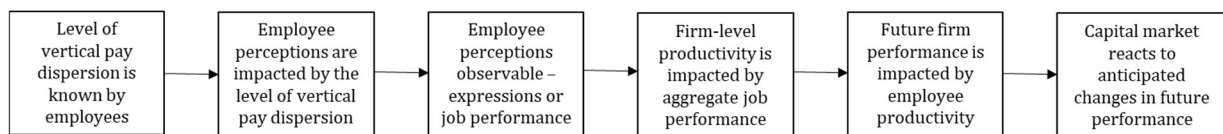


Figure 1: Pathway linking the Pay Ratio Disclosure to capital market reactions via employees

I contribute to the accounting literature by focusing my testing on the first four steps in the proposed pathway thereby measuring the primary effects - impact on employees - as opposed to the subsequent effects - impact on firm performance and shareholder reactions. The second objective of this paper is to leverage findings from the management literature to determine whether performance-based pay might influence the strength, or possibly the direction, of the relation between pay dispersion and employee perceptions. The effects of performance-based pay are often studied within a firm or within an industry; the mandatory Pay Ratio Disclosure introduces a measure of pay dispersion that is available for a broader cross-section of firms and allows for the assessment of whether the findings related to performance-based pay are generalizable.

## *2.2 Prior Literature on Firm Performance and Capital Market Reactions*

Prior literature in accounting focuses on the link between measures of pay dispersion and firm value, firm performance and capital market reactions (Cheng, Ranasinghe and Zhao 2017; Rouen 2019). With respect to the pathway I propose, a test of the association between the Pay Ratio and firm performance is a test of how the first step - level of vertical pay dispersion - impacts the fifth step - impact on future firm performance. Crawford, Nelson, and Rountree (2017) test the relation between an estimated Pay Ratio and capital market reactions effectively testing the association between the first step in the pathway - level of vertical pay dispersion - and the sixth step in the proposed pathway - capital market reactions. The steps in the pathway tested by the contemporaneous literature and my dissertation are depicted in Figure 2.

Cheng et al. (2017) find that industry-adjusted estimated Pay Ratios are positively associated with both firm value and operating performance.<sup>4</sup> In the context of the proposed pathway in which employee perceptions drive the relation between the Pay Ratio and future firm performance, the findings in Cheng et al. imply that employee perceptions are positively associated with greater pay dispersion.

Similar to Cheng et al. (2017), Rouen also tests whether estimated Pay Ratios are associated with future firm performance.<sup>5</sup> Rouen (2019) finds that there is no statistically significant association between the estimated Pay Ratio and future firm performance.

---

<sup>4</sup> Cheng et al. estimate the Pay Ratio based on employee compensation data from PayScale.com. I also use data from PayScale.com, however the data I use from PayScale.com is related to variable compensation for the pay-for-performance proxy variable.

<sup>5</sup> Rouen also uses an estimate of the Pay Ratio. The estimated Pay Ratio used by Rouen is CEO compensation from Execucomp divided by mean employee compensation estimated using data from the Bureau of Labor Statistics.

Rouen (2019) introduces two new measures of vertical pay dispersion by bifurcating the estimated Pay Ratio into two components - the economically *explained* portion of the Pay Ratio and the *unexplained* portion of the Pay Ratio.<sup>6</sup> He finds that when the estimated Pay Ratio is separated into an economically explained component and an unexplained component there is a positive relation between *explained* pay dispersion and firm performance. On the other hand, a negative relation is observed between the *unexplained* portion of the Pay Ratio and firm performance. Taken together the results from Rouen (2019) imply that if the mandated Pay Ratio is not associated with future firm performance this may be due to a failure of the Pay Ratio Disclosure as mandated to present a faithful representation of vertical pay dispersion relevant to employees, and that alternate measures of pay dispersion may be useful in explaining the relation between pay dispersion and future firm performance.<sup>7</sup>

Crawford, Nelson and Rountree (2017) find that a high estimated Pay Ratio is associated with an increase in dissenting votes on Say-on-Pay, a negative shareholder

---

<sup>6</sup> Rouen identifies a variety of establishment-level, firm-level and local macroeconomic factors that he anticipates will drive compensation at the employee level and CEO, firm and industry characteristics that he anticipates will drive CEO compensation. The following is a list of some of the factors he identifies for employee-level compensation: type of job (research and development, technology, retail sales, non-retails sales, non-financial services, manufacturing), percent of employees with supervisory duties, industry-region average compensation, percent of residents who graduated college in the geographic area, whether it is a “Right to Work” state, size of the firm, age of the firm, etc. This list is not comprehensive and is intended only to demonstrate the types of factors he identifies as relevant to the economically explained portion of vertical pay dispersion.

<sup>7</sup> Rouen’s bifurcation of vertical pay dispersion is based on confidential datasets maintained by the Bureau of Labor Statistics. Replicating the bifurcation he performs for the disclosed Pay Ratio would be an informative extension of my findings, but would only be possible with permission from the Bureau of Labor Statistics to access establishment-level data and with a recreation of the datasets Rouen carefully created linking establishment-level data to create firm-level data sets.

reaction.<sup>8</sup> In terms of the proposed pathway, the finding that higher levels of vertical pay dispersions are associated with negative shareholder reactions implies that shareholders anticipate lower firm performance to be associated with higher vertical pay dispersion. Under the assumption that employees are a relevant group that effects a change in firm performance in response to vertical pay dispersion, the Crawford et al. paper implies that shareholders assume a negative employee response to high levels of vertical pay dispersion that impact employee job performance.

In summary, the results of the contemporaneous literature in accounting suggest that there are no clear predictions for whether employee perceptions are positive, negative or non-existent. The results of Cheng et al. imply that employees have positive perceptions of firms with high estimated pay ratios, the results of Crawford et al. imply that employees may have negative perceptions of firms with high pay ratios and the results of Rouen imply that there is no anticipated association with the raw levels of vertical pay dispersion, only to alternate measures of vertical pay dispersion that account for the economically explained and unexplained levels of pay dispersion .

Because all three of the papers in the existing literature use estimated measures of the Pay Ratio, and not the actual Pay Ratio disclosed, the Pay Ratios used in their analyses are effectively three different alternative measures of vertical pay dispersion. If we consider the estimates of the Pay Ratio used in the contemporaneous literature as alternative measures of pay dispersion and substitute Rouen's two proposed alternative measures for his estimate of the Pay Ratio, then anticipated employee perceptions of

---

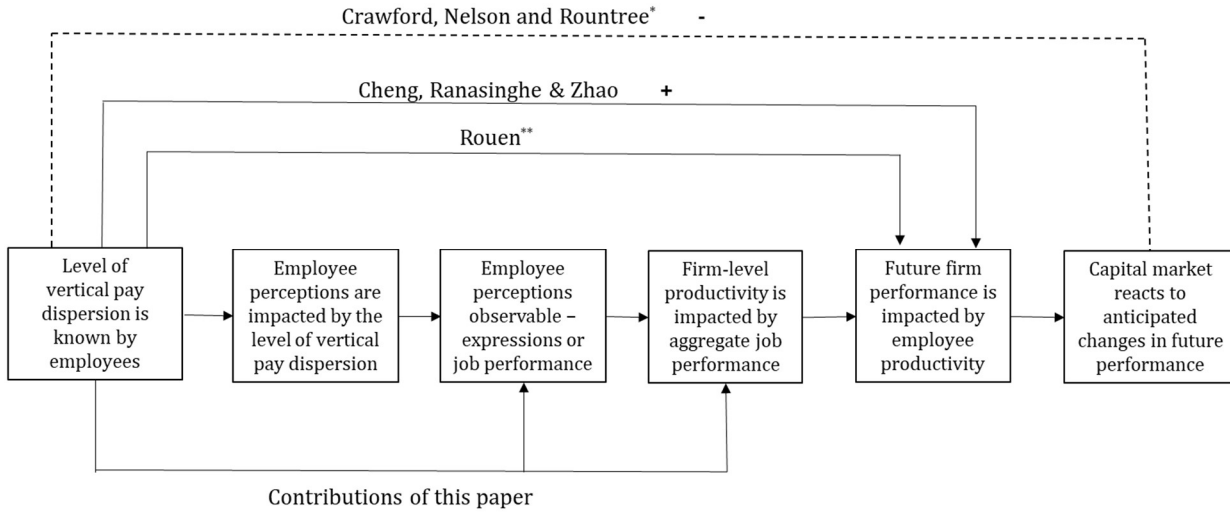
<sup>8</sup> Crawford et al. restrict their study to the banking industry. Banking industry data includes information on overall wages they use to create an estimate of mean employee compensation which is then used to create an estimated Pay Ratio.



vertical pay dispersion are positive in two cases (Cheng et al.; Rouen's Explained Pay Ratio measure) and negative in two cases (Crawford et al.; Rouen's Unexplained Pay Ratio measure). Therefore it is an empirical question whether or not employees' perceptions are associated with the Pay Ratio and whether the association is positive or negative.

At this point it is important to note some important features of the contemporaneous literature in accounting. First, all three working papers cited were written before the Pay Ratio Disclosure went into effect and therefore use estimates of the Pay Ratio. Additionally, each of the three papers uses a different data source to create their estimate of the Pay Ratio and different transformations of the estimated Pay Ratios. The estimates of employee compensation used by Cheng et al. and Rouen are likely to over-represent the domestic workforce relative to the Pay Ratio Disclosure because their data sources are largely focused on US workers whereas the Pay Ratio Disclosure is based on the global workforce. It is unclear ex ante whether that would systematically bias the results of the associations with firm value and performance. In this paper I do not use estimates, I use the mandated Pay Ratios disclosed by firms in their proxy statements filed with the SEC for the fiscal year ended after December 15, 2017. The use of disclosed Pay Ratios is crucial for testing whether the mandated disclosure is a faithful representation of the economic concept of vertical pay dispersion relevant to employees.

Second, Crawford et al. (2017) focus exclusively on the banking industry. In this paper I study a wide variety of industries captured by the S&P 1500 rather than focusing on one particular industry. Including a wider variety of industries in my analysis allows for stronger inferences about the generalizability of the hypotheses.



\* Crawford, Nelson and Rountree is represented as a dashed line for two reasons. First, they use a very specific type of market ration, say-on-pay voting, as opposed to a traditional price reaction. Second, the theory is tested only in the banking industry, although their findings may extend beyond the banking industry it is presented as a tentative result so as not to mischaracterize their research or extrapolate beyond the findings of their paper.

\*\* Rouen finds that the relation between pay dispersion as presented in the Pay Ratio Disclosure and future firm performance is undefined, when the Pay Ratio is decomposed into explained and unexplained portions he finds positive and negative relations, respectively.

*Figure 2: Summary of Contemporary Accounting Literature with respect to the pathway*

### 2.3 Prior Literature on Employee Beliefs about Ideal Compensation Structure

So far I have discussed the contemporaneous work in the accounting area and described whether the observed associations were positive or negative without discussion of why employee perceptions might be positive or negative and how those perceptions might affect firm performance. The second step in the proposed pathway is that pay dispersion affects employee perceptions of the firm and the third step is that those perceptions affect the provision of labor. Theories, derived mainly from the economics literature, present competing views about whether the reaction to pay dispersion might be positive or negative. In this paper I focus on two main systems of beliefs possibly held by employees: Equity Theory and Tournament Theory.

To understand Equity Theory we look first at the Fair Wage-Effort Hypothesis put forward by Akerlof and Yellen (1990) which posits that an employee's choice of effort is dependent on the actual wage offered by the firm relative to a fair wage. The key to understanding how employees will react under Equity Theory is to determine how they evaluate whether wages are fair. There are a variety of bases for determining fair compensation - economic differences, performance differences, abilities, skills, seniority, etc. Based on the relative deprivation theory from psychology, wage comparisons are identified as a key determinant of the fair wage, however, Akerlof and Yellen (1990) admit that the psychology literature is ambiguous about which reference groups will be salient in wage comparisons.

When discussing wage comparisons, the employee that is the subject of the comparison is called the referent. For example, the referent might be another rank-and-file employee at their organization or someone with a similar role at another organization in their industry. When the referent holds the same or a similar role this is defined as horizontal pay dispersion. If the referent holds a role at a different level of the firm's hierarchy the comparison of differences is defined as vertical pay dispersion, for example if the employee's supervisor is the referent. The Pay Ratio is a measure of vertical pay dispersion. Since the focus of this paper is an evaluation of the Pay Ratio Disclosure all inferences drawn relate to employee reactions to vertical pay dispersion.

Crawford et al. (2017) cite Akerlof and Yellen (1990) to describe why high pay dispersion may negatively affect shareholder perceptions. Rouen (2019) motivates his paper by citing Akerlof and Yellen (1990), however instead of relying on a referent as the subject of the wage comparison, he focuses on identifying the economic determinants of

compensation to build the equivalent of a mental model of fair wages that employees might compare their wages to. The portion of pay that is based on the economic determinants is deemed the explained portion, the remainder is labelled unexplained. Rouen's findings are consistent with Equity Theory under the assumption that the employee's mental models of fair wage are based on the economic factors identified in his models, such as industry-region average compensation, whether it is a "Right to Work" state, firm size and firm age.

Tournament Theory based on the seminal paper by Lazear and Rosen (1981) posits that pay structures in which compensation is based on an individual's relative position in the firm rather than his level of output may provide greater motivation to employees and improve their performance. In practice, tournament style pay structures that directly parallel the theoretical model for compensation structure described in Lazear and Rosen (1981) are rare and subsequent literature has often treated tournament style pay structure and high levels of pay dispersion within a firm as roughly comparable constructs. The general implication of tournament style pay is that high pay dispersion will motivate employees to perform better in their attempt to increase their rank in the organization in order to earn higher compensation.

Crawford et al. (2017) cite Tournament Theory as motivation for why high pay dispersion might positively affect firm performance because high pay dispersion provides incentives for employees to increase effort. Cheng et al. (2017) cite Tournament Theory as a reason why high levels of executive compensation may be expected as firms compete for talented CEOs, but do not make specific predictions about whether Tournament Theory will motivate rank-and-file employees .

Under Equity Theory, employees develop a mental model of what they believe to be a fair wage based on a number of factors, for example type of job, skills required for the job, economic factors and their wage relative to others. More specifically an employee's mental model of a fair wage might include variables such as whether the job is manufacturing, retail, service or technology related, whether the job requires a college education or a certain number of years of experience, what the overall cost of living is in their region of the country, and lastly, most closely related to this study, information about the level of vertical pay dispersion, for example the information in the Pay Ratio Disclosure. If the employee determines that their wages are not fair, then the employee will have a negative perception of the firm in accordance with Equity Theory. In accordance with Akerlof and Yellen's (1990) Fair Wage Hypothesis, a part of the Equity Theory literature, we expect that employees reduce their effort when they perceive wages as unfair. In addition to any conscious or subconscious change in effort level, negative perceptions of the firm might affect employee job performance more generally. If employees have lower job performance, including reduced effort, at an individual level the aggregate effect of employee-level differences in job performance will be reflected in the overall firm-level productivity level. If the employee determines that their wages are fair the employee will have a positive perception of the firm and will either maintain or increase effort.

On the other hand, under Tournament Theory, high pay dispersion is by definition associated with positive perceptions and increased productivity, because under Tournament Theory wage differentials serve as the motivation for employees to exert more effort. In the event of a positive association between perceptions and pay dispersion it is not possible to distinguish whether Equity Theory or Tournament Theory serves as the

explanation for employee reactions. However, a negative association between employee perceptions and pay dispersion is consistent only with the case where employees believe in Equity Theory and the information presented in the Pay Ratio leads them to believe that their wages are unfair. Therefore, I present Hypothesis 1 for the only testable case with definitive inferences about whether Equity Theory or Tournament Theory dominates.

***H1:** Vertical pay dispersion is negatively associated with employee perceptions.*

In the association test the average employee rating of a firm's compensation and benefits practices is regressed on the level of vertical pay dispersion within a firm with controls for the size of the firm, industry fixed effects and other control variables from contemporaneous literature as presented in the following equation:

$$OverallRating_t = \beta_0 + \beta_1 PayRatio_t + \sum \beta_k Controls_t + \varepsilon \quad (1)$$

Equation (1) tests the first through the third steps in the proposed pathway by testing the association between the known level of vertical pay dispersion in the first step that impact employee perceptions in the second step and are then expressed in the third step. In addition to expressions of perceptions through ratings or other verbal expressions the employee's perceptions of the firm may also impact the employee's job performance. If job performance is impacted at the individual employee level then firm-level productivity measures will capture the aggregate effect of all employees' perceptions of the firm, the fourth step in the proposed pathway.

***H2:** Vertical pay dispersion is negatively associated with firm-level productivity.*

The test of the association of firm-level productivity with the level of vertical pay dispersion is captured in the following equation:

$$Productivity_t = \beta_0 + \beta_1 PayRatio_t + \sum \beta_k Controls_t + \varepsilon \quad (2)$$

The association tests performed are similar to value relevance studies, except instead of relevance to shareholders reflected in the stock price of the firm I am evaluating the relevance of pay dispersion information with respect to employees captured in their ratings of the firm.

#### *2.4 Prior Literature on Pay-for-Performance*

In their review of the literature on pay dispersion, Downes and Choi (2014) describe moderators that impact the relation between pay dispersion and employee perceptions including pay-for-performance, the nature of interdependence of work, position in the pay distribution, and pay system communication. Downes and Choi (2014) provide a summary of a variety of different papers with different methodologies including surveys with companies and industry groups to obtain data that are not generally publicly available for all companies, e.g. pay system communication and the position of the employee in the pay distribution. Due to limitations in data availability, I focus on the first moderator in this list - levels of pay-for-performance - because data on bonuses and commissions is available for the majority of my sample through online anonymous reporting.

Base salary or hourly wage rate of an employee is often set based on factors such as the employee's skill level and years of experience. In many firms a certain portion of pay is variable and is in some way tied to observable performance measures, for example bonuses, profit-sharing and commissions. Pay that is tied to observable performance measures is presumed to be fairly determined, assuming that the firm has clearly

communicated the relevant performance measures and the method of determination for variable compensation. I focus this section of my study on the impact of the level of performance-based variable compensation under the assumption that it is more closely tied to employee job performance than base pay which is more strongly associated with more static characteristics of the employee such as skill level or years of experience. Understanding the role of performance-based variable compensation creates a more nuanced understanding of what impacts an employee's perceptions of fairness under Equity Theory.<sup>9</sup> Prior literature has often tested this theory by evaluating in existing businesses whether a lack of performance-based pay is associated with a negative reaction to high pay dispersion (e.g., Shaw and Gupta 2007; Kepes, Delery, and Gupta 2009). In a field experiment performed by Breza, Kaur, & Shamdasani (2017), pay differences based on observable performance were perceived less negatively. If pay is based on observable outcomes related to employee performance then the pay is more likely perceived to be fair, i.e. equitable, and any negative reactions to high pay dispersion will be mitigated. Therefore I posit that when pay-for-performance is higher, employee perceptions of high pay dispersion will be less negative.

***H3:** Employee perceptions of high pay dispersion are less negative when performance-based variable pay is higher.*

When testing the moderating effect of performance-based pay, the level of performance-based variable pay is added separately as well as in an interaction

---

<sup>9</sup> Pay-for-Performance is by definition incompatible with compensation structures set under Tournament Theory because under a tournament structure pay is set based on rank within the organization, therefore I focus my discussion on Equity Theory.



term with the level of vertical pay dispersion. This modification is made to the model with the overall rating as the measure of employee perceptions and to the model with the firm-level productivity as the dependent variable, modifying Equations (1) and (2) as follows:

$$OverallRating_t = \beta_0 + \beta_1 PayRatio_t + \beta_2 PerformancePay_t \quad (3)$$

$$+ \beta_3 PayRatio_t * PerformancePay_t + \sum \beta_k Controls_t + \varepsilon$$

$$Productivity_t = \beta_0 + \beta_1 PayRatio_t + \beta_2 PerformancePay_t \quad (4)$$

$$+ \beta_3 PayRatio_t * PerformancePay_t + \sum \beta_k Controls_t + \varepsilon$$

### *2.5 Information Content of the Components of the Pay Ratio Disclosure*

The above hypotheses are designed to provide insight about whether the Pay Ratio is associated with firm-level employee perceptions and productivity without addressing which of the elements of the Pay Ratio Disclosure are informative. The disclosed Pay Ratio is the total annual compensation of the CEO divided by the total annual compensation of the median employee, effectively capturing three different dimensions of the firm's pay structure: level of executive compensation, level of rank-and-file employee compensation and the more abstract notion of vertical pay dispersion. Executive compensation was publicly available prior to the Pay Ratio Disclosure, so in order to assess whether the two new elements of the Pay Ratio Disclosure are informative, I assess the relative and incremental information content of each of the additional components of the disclosure – median employee compensation and the pay ratio. Continuing with the assumption that employees are the relevant user group, I assess the association between the novel elements of

the Pay Ratio Disclosure relative to the existing information about executive compensation as well as whether these novel elements provide incremental information. The information about vertical pay dispersion contained in the Pay Ratio disclosure is relevant to employees' perceptions of the firm if the elements are either relatively or incrementally informative over executive compensation.

***H4a:** The components of the Pay Ratio Disclosure - median employee compensation and the Pay Ratio - are relatively informative over existing disclosures of executive compensation with respect to employee perceptions.*

***H4b:** The components of the Pay Ratio Disclosure - median employee compensation and the Pay Ratio - are incrementally informative over existing disclosures of executive compensation with respect to employee perceptions.*

The relative and incremental information content of the components of the Pay Ratio Disclosure are styled like information content tests used to test whether information from financial statements are relevant to share price, except in this case I test whether the components of the Pay Ratio Disclosure are relevant to employee perceptions of the firm. Relative information content is tested by regressing employee perceptions separately on each of the components of the Pay Ratio Disclosure and using a Vuong (1989) test. Incremental information content is testing by adding each of the components of the Pay Ratio Disclosure to the regression separately to assess whether each additional element statistically significantly improves the fit of the model.

## 2.6 Employee reactions to the Pay Ratio Disclosure

After assessing whether the Pay Ratio Disclosure contains relevant new information over existing disclosures of executive compensation the final step in the analysis is to assess the direction of the impact of the new disclosures on employee perceptions. In the test of the association between the Pay Ratio and overall employee perceptions (OverallRating), the Pay Ratio as disclosed in 2018 was used as a proxy for the level of vertical pay dispersion at the firm that was potentially estimated by employees but was not publicly available for the majority of the measurement period for the OverallRating. Employee perceptions in response to the release of the Pay Ratio Disclosure, as opposed to the association with estimated levels of vertical pay dispersion, are assessed using a difference-in-difference design. The impact on individual employee level ratings is assessed in the months surrounding the first time the Pay Ratio Disclosure appeared in the proxy statements of public companies in 2018. In accordance with the Equity Theory, I expect that the pay ratio will be negatively associated with employee perceptions of the firm after the Pay Ratio is made public.

***H5:** Disclosure of the Pay Ratio is associated with more negative employee perceptions in firms with a higher Pay Ratio.*

In the equation presented below for the difference-in-difference design, the *Post* variable takes a value of 1 for ratings posted in the period after the Pay Ratio was first disclosed in 2018. The disclosure was mandatory for all publicly traded firms, with few exceptions, therefore in place of a control group, as is standard in a normal difference-in-difference design, the sample of firms is partitioned into two groups based on whether the Pay Ratio for the firm is above or below the median and the group with an above median

Pay Ratio is designated as the treatment group (*HighPayRatio*) as shown in the following equation:

$$\begin{aligned} IndividualRating_t = & \beta_0 + \beta_1 HighPayRatio_t + \beta_2 Post + \beta_3 HighPayRatio_t * Post \quad (5) \\ & + \sum \beta_k Controls_t + \varepsilon \end{aligned}$$

### **III. RESEARCH DESIGN**

#### *3.1 Sample*

The starting pool of 1,814 firms is comprised of firms in the 2013 S&P 1500, 2016 S&P 1500 and firms with data in the Execucomp database for 2016. The information from the Pay Ratio Disclosure was then collected from the proxy statements of these firms for the first firm year ending after December 15, 2017, the first filing for which the Pay Ratio was a mandatory disclosure. There were 1,128 firms from the pool that had filed a proxy statement by April 30<sup>th</sup>, 2018 containing the Pay Ratio Disclosure. See Table 1 for a detailed summary of the sample selection procedures.

The three quantitative amounts presented in the Pay Ratio Disclosure are: total annual CEO compensation, total annual compensation of the median employee and the CEO-to-Median Employee Pay Ratio. CEO compensation in the Pay Ratio Disclosure is calculated in accordance with Item 402 of Regulation S-K as it has been for prior disclosure of compensation of named executive officers. Therefore the executive compensation component of the disclosure provides no new information with respect to CEO compensation.

**Table 1: Sample Selection Procedures**

	Number of Firms	
	Hypotheses 1, 2, 4 & 5	Hypothesis 3 *
Starting sample: Firms in cross-section of S&P 1500 for 2013, S&P 1500 for 2016 and Execucomp for 2016	1,814	
(Firms with no proxy statement filed by April 30, 2018)	(559)	
(Firms without the Pay Ratio Disclosure in the 2017 Proxy Statement)	<u>(127)</u>	
Firms with a proxy statement filed by April 30, 2018 that contains the Pay Ratio Disclosure	1,128	
<hr/>		
For analyses involving perceptions measures		
Starting sample: Proxy statements with the Pay Ratio Disclosure	1,128	
(No matching firm or no reviews found on Glassdoor)	<u>(65)</u>	
Sample for analyses involving perceptions measures	1,063	952
<hr/>		
For analyses involving productivity measures		
Starting sample: Proxy statements with the Pay Ratio Disclosure	1,128	
(Total employee population missing from the Pay Ratio Disclosure)	<u>(416)</u>	
Sample for analyses involving productivity measures based on PRD data for all firms	712	
(Loss firms)	<u>(123)</u>	
Sample for analyses involving productivity measures based on PRD for non-loss firms	589	523

\* Testing of Hypothesis 3 requires that pay-for-performance data be available for the firm. The sample sizes in this column reflect the updated number of firms for which pay-for-performance data are available from PayScale.com

Identification of the median employee and calculation of median employee compensation is a new feature required by this disclosure. Once firms identify the median employee, the median employee's total annual compensation must be calculated under the definition of total compensation in Item 402(c)(2)(x) to be consistent with the calculation of CEO compensation.

Once the median employee compensation is calculated, the final step firms take is to calculate the third element of the Pay Ratio Disclosure, the CEO-to-Median Employee Pay Ratio. This measure is simply the ratio of CEO total annual compensation to total annual compensation of the median employee. For example, if the firm calculates that the median employee is paid \$75,000 per year and the CEO is paid \$18,750,000 then the Pay Ratio for the firm is 250. When I refer to the Pay Ratio I am referring to this last quantitative value presented for each firm which illustrates the pay dispersion between the CEO and the median of rank-and-file employees.

### *3.2 Measures of Pay Dispersion*

The Pay Ratio disclosed in the proxy statement is based on the identification of the median employee and calculation of the median employee's compensation for a day of the firm's choosing within the last three months of the firm's fiscal year. The sample in this paper is comprised of firms with fiscal year end dates after December 15, 2017 with proxy statements released before April 30, 2018. The majority of the firms in the sample are December 31<sup>st</sup> year end firms. For December 31<sup>st</sup> fiscal year end firms the possible measurement dates for the median employee's compensation were any days in October through December 2017. For December 31<sup>st</sup> fiscal year end firms the first set of proxy

statements containing Pay Ratio Disclosure were issued beginning in February 2018 and I restrict the sample to firms with Pay Ratios disclosed by April 2018.

The Pay Ratio as presented in the proxy statement is the basis for the two key measures of pay dispersion that I use in my analyses. However, there are many concerns that have been raised about the use of the raw Pay Ratio as presented in the disclosure. One of the main concerns with respect to the comparability of the measure across firms is that there are many characteristics of a firm that have a strong impact on the ratio that are unrelated to firm choices about compensation, for example size of the firm and industry. To the extent that the structure of compensation within a firm is driven by firm characteristics such as industry or size, the industry-size adjusted value of the Pay Ratio (*Pay Ratio Ind Size Adj*) mitigates some of the structural drivers of pay dispersion in order to identify the compensation differences driven by firm-level choices.

### *3.3 Measures of Employee Perceptions*

There are two measures of perceptions used in this paper – a cumulative measure of employees’ perceptions of the firm and perceptions of individual employees. Both proxies for employees’ perceptions are based on the online ratings of the company’s compensation and benefits on the Glassdoor website. Current or former employees of a firm can at any time voluntarily review a firm on the Glassdoor website. Recent studies in the accounting literature use reviews from Glassdoor as a source of information about employee perceptions and sentiment. Hales, Moon, and Swenson (2018) use employee reports of the short-term outlook for the firm as a measure of inside information about the firm and find that employee outlook reported in Glassdoor positively predicts future firm performance,

including sales and net income. Employee reports on Glassdoor present an opportunity for researchers to assess employee perceptions of a large number of firms without performing a survey. I use employee ratings of the firm's compensation and benefits as a quantitative expression of the employee's perceptions of the firm.<sup>10</sup>

In the set of association tests I use the average employee rating of compensation and benefits (*OverallRating*). This average is cumulative over time and is equal weighted for each review. The average score is maintained on an ongoing basis by the Glassdoor website and is pulled directly from the Application Programming Interface. The average employee rating includes reviews posted by employees from the time the Glassdoor website started in 2009 through the year covered by the Pay Ratio Disclosure and up until the Pay Ratio was disclosed for the first time in 2018. The average compensation and benefits rating on April 18, 2018 is used as the *OverallRating*.

The  $t$  subscript on the *OverallRating* perception measure signifies that the overall rating is largely based on reviews of the company posted before the disclosure of the Pay Ratio. On average only 5-6% of the ratings which comprise the *OverallRating* were posted between December 31<sup>st</sup>, 2017 and April 18<sup>th</sup>, 2018. The *OverallRating* is intended to capture the general perceptions employees' have of the firm, not the reaction to the Pay Ratio Disclosure. To the extent that the *OverallRating* measure captures the reaction to the disclosure itself it is preliminary evidence of the relevance of the Pay Ratio Disclosure tested more directly in the difference-in-difference design. However, given the small proportion of ratings that were posted after the disclosure of the Pay Ratio and the fact that

---

<sup>10</sup> A screenshot from the Glassdoor website of the page where an employee would rate the firm with respect to compensation and benefits is included in Appendix A.



almost half of the company's had no change in the overall compensation and benefits ratings between December 31<sup>st</sup> 2017 and April 18<sup>th</sup>, 2018 this evidence of a reaction to the disclosure is very weak evidence and the *OverallRating* is assumed to largely measure employee perceptions before the disclosure.

In contrast to the *OverallRating* which is a historical measure of the employees' perceptions before the disclosure, the *IndividualRating* used in the difference-in-difference design reflects the compensation and benefits ratings from individual reviews identified in the specific windows surrounding the Pay Ratio Disclosure. More specifically, assuming that February through April 2018 is the disclosure period I set two different window lengths to test the robustness of my inferences. In the three-month (six-month) window individual ratings from November 2017 to January 2018 (August 2017 to January 2018) are considered pre-disclosure ratings and ratings from May through July 2018 (May through October 2018) are considered post-disclosure ratings.

For the firms in the sample the median (mean) number of individual ratings per year since Glassdoor started collecting reviews is 507 (1,259) reviews per year. On average the number of reviews posted per year is increasing and the median (mean) number of reviews per year per company in the sample was 635 (1,400). The company at the 25<sup>th</sup> percentile had 218 reviews in 2018 and the company at the 75<sup>th</sup> percentile had 1,717 reviews in 2018. Given the number of respondents per company is generally hundreds or thousands and the average score is around 3.4 and the standard deviation is around 1.2 the concern that only disgruntled employees post reviews is less plausible.

### *3.4 Measures of Productivity*

In addition to whether or not employees' perceptions are impacted it is important to evaluate whether pay dispersion has an impact on the provision of labor, therefore I include a measure of labor productivity. I use firm-level data where net income is the measure of output and number of employees is the measure of labor capacity. Labor productivity is measured simply as the natural log of net income per employee for non-loss firms (*Productivity*).

### *3.5 Pay-for-Performance as a Moderator*

The website PayScale.com allows for employees to voluntarily self-report data on compensation. I use self-reported data related to variable compensation from the website PayScale.org as a measure of pay-for-performance. Variable compensation includes bonuses, profit sharing, commissions and other forms of compensation that are likely to be performance based.<sup>11</sup> PayScale.com provided me with firm-level information about the levels of variable pay for the majority of my sample (see the column titled Hypothesis 3 in Table 1 for the sample size with the relevant Pay-for-Performance). More specifically, the *PerformancePay* variable is the mean dollar value amount of variable pay provided by a firm after accounting for employees who do not report variable pay as having received none. For example, if 75% of employees reported receiving variable pay and the mean of the reported variable pay is \$12,000 then *PerformancePay* would take a value of \$9,000.

---

<sup>11</sup> A screenshot from the PayScale website of the page where an employee would enter variable compensation is included in Appendix B.

### *3.6 Data Limitations*

There are many potential issues with using third party data sources as opposed to information directly from the firm's mandatory SEC filings or other regulated sources of data. In particular there are concerns about the integrity of the Glassdoor and PayScale data that are used in this study. The potential for fictitious data and the consequences of self-selection are two key issues. In order to access salary information on the Glassdoor website an individual must post information about their current or former employer. Similarly, in order to get an estimate of their market wage in the "What am I Worth?" tool on the PayScale website employees must enter compensation information about current or prior work. The requirement to post information to get access to desired information increases the chances of fictitious data if an individual is attempting to access information quickly and enters erroneous or incorrect data simply to gain access. The advantage of this requirement is that it increases the number of people who will post on the website which will minimize the free rider problem associated with the website as a public good and likely result in reports from a wider range of employees.

An additional source of potential fictitious data is the firm itself or competitors. If a firm wants to make themselves appear more favorable on Glassdoor, agents of the firm might post positive fictitious reviews or higher compensation. On the other hand, if a firm wants to make a competitor appear worse on Glassdoor they might post fictitious negative reviews or lower compensation. Posting a fictitious review is costly in terms of effort and time, although these costs may be sufficiently low that a firm is willing to risk the reputational consequences if this act was discovered.

There are two main dimensions to the self-selection bias: who is reporting and their motivation for reporting. Glassdoor and similar sites often have job postings as well as information about salary levels and reviews of the firm, increasing the likelihood that somebody who is transitioning or considering transitioning jobs will be using the site. Second, once an individual is at the stage where they are evaluating which firms to apply to, interview with, or accept an offer from they may use the reviews sections of the site to gain some insight into the culture of the firm. Third, when an individual is in salary negotiations with their existing employer or a prospective employer they might use the salary information from either Glassdoor or PayScale as a benchmark. The population of individuals posting on Glassdoor and PayScale is likely to be largely comprised of individuals who are considering or actively pursuing a job change or renegotiating their compensation.

There are a few characteristics of employees that I anticipate increase the likelihood of self-reporting on the Glassdoor or PayScale websites: being a white collar worker and not being in the tails of the distribution of compensation. In order to voluntarily self-report data to the Glassdoor or PayScale website the individual must be aware of its existence which makes it more likely that individuals with white collar positions who are accustomed to doing internet research will use the site. Self-reported salaries on the site represent a small proportion of the total population of employees and it is possible that this is a non-random sample.

It is possible that the type of individual who reports on Glassdoor is more likely to be someone from the middle of the distribution of compensation. Executives and top level management are unlikely to use these types of websites because their job hunting process

is based on the work of head hunters or through social connections as opposed to online applications for work. Lower level employees, in particular minimum wage workers, may be less likely to report on these types of sites because they know their salary expectations and are unlikely to use these sites which are often used to better understand an individual's salary level in the labor market.

It is also important to consider the possible motivation current and former employees have for posting on the site. Individuals who are disgruntled with a firm are more likely to post a negative review. This by itself does not necessarily create bias in the data because it may be an accurate reflection of that employee's view of the firm. Another consideration is that employees who are transitioning to a new job may have incentives to over report their salary level at their prior place of employment. If the employee intends to use salary data for their former role as a benchmark for future pay they have incentives to make that benchmark higher.

The timing of the data is also a potential limitation of the data. The ratings from Glassdoor used in the association tests are cumulative as is the compensation data from PayScale. Unlike data which is reported on the firm's financial statements which have a definitive time period the cumulative average measures obtained from Glassdoor and PayScale cover an undefined time period and may contain stale observations from up to a decade ago. It is important to note that the analyses I perform relate to differences across firms, not time series analyses, decreasing the need for data related to a specific time period although not nullifying concerns about stale data. The individual ratings used in the difference-in-difference design are not subject to concerns about time frame because they are constrained to the time periods prescribed in the difference-in-difference design.

Given the many potential limitations of these novel data sources, the results should be interpreted with caution. The fact that the data are subject to these limitations makes it all the more important that the data be corroborated against outside sources to the greatest extent possible and future replications of this work using alternative sources are necessary for the validation of these findings. Glassdoor, PayScale and other similar websites are currently the best publicly available sources of compensation information for firms, which is by and large an opaque area of public firm management, and the best source of insight into employees' perceptions of the firm. Despite the data limitations, the questions addressed in this paper are of social and political importance therefore I proceed with the analyses making clear at least some of the potential limitations of the data used.

### *3.7 Control variables*

I control for a number of firm characteristics that might be associated with the level of pay dispersion within the firm as well as employee perceptions. Summary statistics of the median Pay Ratio across a variety of cuts present a clear picture that firm factors such as industry and size are strongly associated with the level of the Pay Ratio and may also impact employee perceptions. Phan (2018) defines firm size in terms of market capitalization and finds that for the Russell 3000 firms the median Pay Ratio for firms with less than \$1 billion in market cap is 32 compared to a median Pay Ratio of 213 for firms with greater than \$25 billion in market cap, the median Pay Ratio for firms with a market cap of \$5-\$10 billion is 110. The industry in which the firm operates is also another major driver of the level of vertical pay dispersion. For the consumer goods sector, Phan (2018)

finds that the median Pay Ratio is 142, whereas the median Pay Ratio is 46 for the financial sector and 88 for industrial goods.

These two important characteristics - size and industry - are controlled for in a variety of ways. In the majority of the analyses regressions are performed using the log transformed Pay Ratio (*Ln Pay Ratio*) and controls are included for size and industry. I define firm size in terms of the amount of assets and include the natural log of assets (*Ln Assets*) on the balance sheet at fiscal year end 2017, which will be within three months of when the Pay Ratio is measured, as a control for size. Industry fixed effects are included to control for the variation in average Pay Ratio across two digit SIC codes. Standard errors are clustered by industry. In addition to the regressions that are performed using the log transformation of the Pay Ratio, I also calculate an industry-size adjusted Pay Ratio (*Pay Ratio Ind Size Adj*). To calculate the industry-size adjusted Pay Ratio I find the median Pay Ratio for each size quintile of a given two digit SIC code, then I subtract the median for the industry-size bucket from the ratio for the firm resulting in an industry-size adjusted Pay Ratio that reflects to what degree the Pay Ratio for the firm is higher or lower than the Pay Ratio expected for the industry-size bucket. When the industry-size adjusted Pay Ratio is used then the measures of pay-for-performance, CEO compensation level and median employee compensation level are also industry-size adjusted.

In addition to industry and size, several other factors identified in prior research involving vertical pay dispersion and firm performance are identified and controlled for. Although my dependent variables are related to employee perceptions, because I hypothesize that employee perceptions are part of the proposed pathway between the Pay Ratio and firm performance many of the same control variables are included. I control for

the variability in the firms return on assets (ROAVAR), annual returns (RET), variability of returns within the year (RETVAR), book-to-market ratio (BTM), capital expenditures scaled by total assets (CAPEX), leverage (LEV), the Hirschman-Herfindahl Index as a measure of industry concentration (HHI) and whether or not the firm incurred a loss for the fiscal year 2017 (LOSS). Control variables are measured for the 2017 fiscal year contemporaneous with the measurement of the Pay Ratio and therefore presented with the subscript t in the equations.

## **IV. EMPIRICAL ANALYSIS**

### *4.1 Descriptive Statistics*

Table 2 provides descriptive statistics on the firm-level variables used in the regression analysis. In the statistics for the *OverallRating* measure the employee's ratings of firm compensation and benefits on a five point scale obtained from the Glassdoor.com website have a mean and median value of 3.4 with a standard deviation of 0.49.

*Productivity* has a mean value of 10.44 which translates to \$34,200 of net income per employee. The summary statistics for the elements from the Pay Ratio Disclosure - CEO compensation, median employee compensation and the Pay Ratio - are presented for the pay ratio value presented in the disclosure, rather than the transformations used in the regression analysis. The mean (median) Pay Ratio for the firms in the sample is 187 (92), the mean (median) CEO compensation is \$8,254,861 (\$6,004,344) and the mean (median) value of median employee compensation is \$73,766 (\$64,002). The average dollar amount of variable compensation received by employees based on PayScale.com data is presented as the *PerformancePay* variable and the mean (median) value is \$5,472 (\$3,245).



**Table 2: Descriptive Statistics**

Variable	Mean	Standard Deviation	Q1	Median	Q3
<i>OverallRating</i>	3.40	0.49	3.1	3.4	3.7
<i>IndividualRating</i> (3 month)*	3.37	1.25	3	3	4
<i>IndividualRating</i> (6 month)*	3.38	1.26	3	4	4
<i>Productivity</i>	10.44	1.61	9.47	10.41	11.34
<i>Pay Ratio</i>	187.63	377.04	51	92	184.5
<i>CEO Compensation Median Employee Compensation</i>	8,254,861	7,628,231	3,526,337	6,004,344	10,800,000
<i>Pay for Performance</i>	73,766	45,151	44,797	64,002	95,777
<i>LNAT</i>	5,472	3,209	3,245	4,875	6,885
<i>ROA Var</i>	8.5592	1.7231	7.3653	8.5065	9.7143
<i>RET</i>	0.0418	0.0615	0.0102	0.0211	0.0457
<i>Ret Var</i>	0.1462	0.3315	-0.0421	0.1331	0.3204
<i>BTM</i>	0.0193	0.0082	0.0135	0.0170	0.0226
<i>CAPEX</i>	0.4503	0.4101	0.2145	0.3933	0.6190
<i>LEV</i>	0.0703	0.1262	0.0139	0.0298	0.0612
<i>HHI</i>	0.2598	0.2074	0.0776	0.2511	0.3830
<i>LOSS</i>	0.0789	0.0907	0.0306	0.0500	0.0866
	0.1578	0.3647	0	0	0

\* Summary statistics for the different window lengths for the difference-in-difference design are presented separately for transparency.

See Appendix C for variable descriptions. The sample consists of 1,128 observations identified in Table 1 as having filed a proxy statement by April 30, 2018 that contains the Pay Ratio Disclosure. The raw amounts of CEO compensation and median employee compensation as presented in the Pay Ratio Disclosure are presented above for information purposes. When CEO compensation and the level of median employee compensation are used in the information content tests presented in Tables 5 and 6 these variables are transformed as described in the table - raw, log transformed, industry-size adjusted raw amounts and as a binary variable that takes a value of 1 for values above the media.

#### 4.2 Association between the Pay Ratio and Employee Perceptions and Productivity

The starting point of the empirical analysis is a test of H1, wherein employee related measures expressions of perceptions and effort level choices (captured by the variables *OverallRating* and *Productivity* in the model below) – are regressed on the transformations of the Pay Ratio (denoted as *PayRatio* in the model below) and control variables. The objective of these analyses is to assess whether there is an association between the levels of vertical pay dispersion in a firm and either the employees’ perceptions of the firm, the overall level of productivity of employees within the firm, or both.

The results of the regression of overall rating of the firm on the level of vertical pay dispersion (Equation (1)) and the regression of firm-level productivity on the level of vertical pay dispersion (Equation (2)) are presented in Table 3. Columns (1) through (4) contain the results when aggregate expressions of perception are the employee related measure of interest (Equation (1)).

The association between the Pay Ratio and employee perceptions provides insights into whether the level of pay dispersion in a firm is relevant to employees’ perceptions of a firm. In Column (1) the cumulative average compensation and benefits rating from Glassdoor (*OverallRating*) is regressed on the natural log of the Pay Ratio presented in the proxy statement, the natural log of assets is used as a proxy for firm size, industry fixed effects are included and standard errors are clustered by industry as well. The coefficient on the natural log of the Pay Ratio (*LnPayRatio*) is negative and statistically significant at the 1% level. The observed negative coefficient on the natural log of the Pay Ratio is consistent with Hypothesis 1 that high pay ratios are associated with more negative

**Table 3: Overall Employee Perceptions, Productivity and the Pay Ratio**

This table reports the OLS regression results of aggregate employee related measures - Overall Rating and Productivity - on the CEO to Median Employee Pay Ratio. See Appendix C for variable definitions. Statistical significance of the reported coefficients is based on standard errors clustered by industry. \*\*\*, \*\* and \* represent significance at the 1%, 5% and 10% level, respectively.

	Overall Rating			Productivity				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Ln Pay Ratio</i>	-0.070*** (-3.19)	-0.073*** (-3.25)	-0.023** (-2.03)	-0.024** (-2.08)	-0.554*** (-4.96)	-0.622*** (-5.30)	-0.227*** (-5.19)	-0.244*** (-5.34)
<i>Pay Ratio Ind Size Adj</i>								
<i>Ln Assets</i>	0.087*** (8.23)	0.101*** (8.53)	0.065*** (7.43)	0.080*** (7.12)	0.284*** (5.76)	0.281*** (4.46)	0.0988** (2.26)	0.0943* (1.74)
<i>ROA Var</i>		0.563* (1.99)		0.558* (1.98)		7.227*** (3.01)		7.157** (2.63)
<i>RET</i>		0.106** (2.52)		0.100** (2.34)		0.870*** (4.47)		0.774*** (3.81)
<i>RET Var</i>		2.203 (0.89)		3.298 (1.38)		-42.34*** (-2.71)		-36.23** (-2.10)
<i>BTM</i>		-0.152*** (-3.76)		-0.149*** (-3.71)		0.0871 (0.24)		0.142 (0.36)
<i>CAPEX</i>		0.468*** (4.23)		0.495*** (4.16)		2.310* (1.98)		2.472** (2.19)
<i>LEV</i>		-0.308*** (-3.25)		-0.334*** (-3.43)		0.0186 (0.05)		-0.300 (-0.77)
<i>HHI</i>		2.034*** (5.89)		1.683** (2.42)		-12.36*** (-3.39)		-5.626* (-1.79)
<i>LOSS</i>		0.00644 (0.15)		0.00520 (0.12)		0 (.)		0 (.)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Firms	1,061	1,052	1,062	1,053	589	584	589	584
Adj R-Squared	24.0%	27.3%	23.4%	26.7%	47.8%	54.3%	46.4%	52.3%

perceptions of the firm consistent with Equity Theory dominating Tournament Theory with respect to overall employee perceptions across the population of firms sampled.

In Column (2) additional control variables are introduced, but the direction, magnitude and statistical significance of the coefficient on *LnPayRatio* is not materially different. In Column (3) the Pay Ratio variable is transformed to account for differences across different size firms within different industries. In the regression of *OverallRating* on *Pay Ratio Ind Size Adj* the coefficient on the Pay Ratio variable is still negative and statistically significant reinforcing the inferences obtained using *LnPayRatio* and providing evidence that this association is robust even after accounting for industry-size differences across firms. The results provide additional evidence consistent with H1 that Equity Theory dominates and that high levels of vertical pay dispersion are associated with negative employee perceptions after adjusting for important industry-size differences in the level of the Pay Ratio. The addition of control variables in Column (4) does not alter inferences. Using the coefficient on *Pay Ratio Ind Size Adj* from Column (4) I find that a one standard deviation increase in the industry-size adjusted Pay Ratio is associated with a two-thirds of a standard deviation decrease in the average compensation and benefits rating on Glassdoor.

Switching the focus from employee perceptions of the firm expressed in online ratings to the overall level of productivity of employees, Columns (5) through (8) contain the results when productivity is the employee related measure of interest (Equation (2)). Testing the association between the Pay Ratio and overall productivity at the firm goes beyond whether pay dispersion impacts perceptions by investigating whether there is any

association with a quantifiable impact on firm performance, in this case specifically a productivity measure.

The regression of net income per employee (*Productivity*) on the natural log of the Pay Ratio (*LnPayRatio*) is presented in Column (5). These results parallel the results from Column (1), the coefficient on *LnPayRatio* is negative and statistically significant. This is consistent with Hypothesis 2 that overall employee job performance is negatively associated with the level of vertical pay dispersion. This negative and statistically significant association is robust to adding in control variables in Column (6), switching to the industry-size adjusted Pay Ratio in Column (7) and adding controls to the regression with the industry-size adjusted Pay Ratios in Column (8). In terms of quantifying the impact on productivity I find that a one standard deviation increase in the industry-size adjusted Pay Ratio is associated with a one quarter of a standard deviation decrease in net income per employee. These association tests between the two different transformations of the disclosed Pay Ratio, natural log and industry-size adjusted, with the two different measures of aggregate employee perceptions - overall ratings of the firm's compensation and benefits practices and the firm-level productivity measures - capture the overall negative relationship between high levels of vertical pay dispersion and aggregate employee perceptions of the firm.

#### *4.3 Testing the moderating effect of performance based pay*

In the test of H2, the pay-for-performance (*PerformancePay*) variable anticipated to moderate the relation between pay dispersion and employee perceptions is introduced and the pay-for-performance amount is interacted with the level of pay dispersion.

The results of the regressions for Equations (3) and (4) are presented in Table 4. Parallel to Table 3, Columns (1) through (4) contain the results when aggregate employee ratings are the dependent variable and columns (5) through (8) contain the results when productivity is the dependent variable. In Columns (1),(2), (5) and (6) the natural log of the Pay Ratio is the transformation of the Pay Ratio used. In these regressions using *LnPayRatio* the negative association between the Pay Ratio and employee perceptions observed in Table 3 persists. However, when the natural log of the Pay Ratio is used and the unadjusted dollar amount of variable compensation (*PerformancePay*) is the variable of interest, the coefficients on *PerformancePay* and the interaction of the *LnPayRatio* and *PerformancePay* are not statistically significant.

In columns (3), (4), (7) and (8) industry-size adjusted values of *PerformancePay* are used to account for differences in the level of variable compensation across different size firms in different industries to be consistent with the use of the industry-size adjusted Pay Ratio. In Column (3) where aggregate employee ratings are regressed on the industry-size adjusted Pay Ratio, industry-size adjusted performance pay, and the interaction of these two elements, the coefficient on *PerformancePay Inds Size Adj* is positive and the coefficient on the interaction term is positive. The positive coefficient on the *PerformancePay Ind Size Adj* variable implies that employee perceptions are more positive when there is a larger amount of variable compensation. The positive coefficient on the interaction of *Pay Ratio Ind Size Adj* and *PerformancePay Ind Size Adj* is consistent with Hypothesis 3 that a higher amount of performance based pay is associated with more positive perceptions of high pay ratios. In Column (4) I find that the coefficient on *PerformancePay Ind Size Adj* is robust to

**Table 4: Moderating Effect of Pay for Performance**

This table reports the OLS regression results of measures of employee related measures – perceptions and productivity – on the CEO to Median Employee Pay Ratio and Pay for Performance. See Appendix C for variable definitions. Statistical significance of the reported coefficients is based on standard errors clustered by industry. \*\*\*, \*\* and \* represent significance at the 1%, 5% and 10% level, respectively.

	OverallRating			Productivity				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Sign							
<i>Ln Pay Ratio</i>	-	-0.0673*** (-2.66)	-0.0726*** (-2.82)		-0.513*** (-4.33)	-0.606*** (-4.50)		
<i>PerformancePay</i>	+	0.00000351 (0.18)	0.00000963 (0.53)		-0.0000788 (-0.58)	-0.000112 (-0.93)		
<i>Ln Pay Ratio * PerformancePay</i>	+	0.00000734* (1.69)	0.00000547 (1.30)		0.0000332 (1.11)	0.0000345 (1.28)		
<i>Pay Ratio Ind Size Adj</i>	-			-0.0308** (-2.60)			-0.245*** (-3.94)	-0.272*** (-4.06)
<i>PerformancePay Ind Size Adj</i>	+			0.0000341*** (6.90)	0.0000318*** (8.36)		0.0000642** (2.62)	0.0000438* (1.92)
<i>Pay Ratio ISA * PerformancePayISA</i>	+			0.00000338** (2.01)	0.00000182 (0.88)		0.0000335*** (4.83)	0.0000291*** (3.91)
<i>Ln Assets</i>		0.0756*** (6.68)	0.0868*** (7.05)	0.0702*** (6.94)	0.0807*** (7.04)	0.277*** (4.69)	0.293*** (3.82)	0.146*** (4.22)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Firms	920	913	921	914	508	504	508	504
Adj R-Squared	32.1%	35.2%	31.1%	34.2%	45.1%	52.7%	45.9%	51.9%

the addition of control variables, the coefficient on the interaction term still has the anticipated sign, but with a reduced magnitude and is no longer statistically significant.

In order to understand the competing effects that performance based pay and the pay ratio have on employee perceptions, I estimate the effect of a one standard deviation increase in the Pay Ratio with a simultaneous increase of one standard deviation in pay-for-performance. Using the coefficients from Column (3) a one standard deviation increase in *PerformancePay Ind Size Adj* results in an increase in the ratings of 0.0883, a one standard deviation increase in the *Pay Ratio Ind Size Adj* decreases the rating by -0.0527 and the interaction of a one standard deviation increase in both increases the rating by 0.0150118. The interaction of the simultaneous increase in variable compensation and the Pay Ratio, partially mitigates the negative effects of the increase in the Pay Ratio. The net effect on average for all the firms in the sample is a one tenth of one standard deviation increase in the Compensation and Benefits rating (*OverallRating*).

In Columns (7) and (8) with *Productivity* as the dependent variable the results are similar to when *OverallRating* is the dependent variable. The coefficient on the *Pay Ratio Ind Size Adj* remains negative and statistically significant at the 1% level, the coefficient on *PerformancePay Ind Size Adj* is positive and statistically significant at the 10% level and the coefficient on the interaction term is positive and statistically significant at the 1% level. Again, these results are consistent with Hypothesis 3 that employee perceptions of high levels of pay dispersion are less negative when there is a higher level of performance-based variable compensation. Due to the endogenous nature of compensation structures there may be a correlation between the level of vertical pay dispersion and the level of performance-based variable compensation for the general population of employees.



Therefore it is not possible to identify whether there is a causal relationship between the implementation of performance-based variable pay and the mitigation of negative perceptions of high levels of vertical pay dispersion, however the results do suggest that this could be a productive line of research. Quantifying these results using the coefficients from Column (8) I find that the net effect on average for all firms in the sample of a one standard deviation increase in each performance based pay and the pay ratio is a one tenth of one standard deviation decrease in Net Income per Employee (*Productivity*).

#### *4.4 Testing the relative and incremental information content of the Pay Ratio Disclosure components*

The final set of analyses relate to assessing whether the novel elements of the Pay Ratio Disclosure – median employee compensation and the Pay Ratio – contain information associated with employees’ perceptions of the compensation and benefits that could not be inferred from the disclosure of Executive Compensation alone. Prior to the Pay Ratio Disclosure, information about individuals’ compensation within a company was limited to disclosures about compensation of executives. To assess the relative information content of each of these components of the Pay Ratio Disclosure, I employ the test first described by Vuong (1989) as seen in use in the accounting literature in Dechow (1994). Dechow (1994) uses a series of non-nested hypotheses to test the relative information content of Earnings, Cash Flow from Operations, and Net Cash Flow. My analysis includes testing non-nested models for testing the relative information of content of the Pay Ratio and, separately, the level of median employee compensation relative to the existing disclosure of Executive Compensation. Then I use nested models to test the incremental information content of

each of the components of the Pay Ratio Disclosure. In the context of Dechow (1994) information content is defined with respect to shareholders; in my context I am assessing the information content with respect to employee perceptions using employee ratings of compensation and benefits as the dependent variable in all models.

For the Pay Ratio Disclosure to be more informative than the existing disclosures with respect to employee perceptions of compensation practices at the firm it must be the case that either or both of the novel elements of the Pay Ratio Disclosure – the level of median employee compensation or the Pay Ratio – must be relatively or incrementally more informative than Executive Compensation level as described in Hypothesis 4(a) and 4(b).

The results of the regressions of non-nested models and the Vuong Z-statistic are reported in Table 5. Panel A presents the relative information content of the Pay Ratio over Executive Compensation level. Panel B presents the relative information content of the level of Median Employee Compensation over Executive Compensation. For each of the models compared the various transformations of values used in prior analyses are assessed. For example the first line of Panel A presents the regression of aggregate compensation and benefits ratings (*OverallRating*) on the value of CEO compensation presented in the Pay Ratio Disclosure before the log transformation. Then the aggregate compensation and benefits ratings is regressed separately on the Pay Ratio before log transformation. The R-squared values for each of these separate regressions are presented in the first line of Panel A of Table 5. To test whether the difference in R-squared values is statistically significant Vuong's Z-statistic is used.

**Table 5: Relative Information Content of Pay Ratio Disclosure Components**

Information content of the novel components of the Pay Ratio Disclosure over Executive Compensation are tested using the Vuong (1989) test of non-nested model comparisons. A statistically significant positive Z-statistic indicates that the second component tested is rejected in favor of the first component and therefore the first component is considered relatively more informative. A statistically significant negative Z-statistic indicates that the first component tested is rejected in favor of the second component and therefore the second component is considered relatively more informative.

**Panel A: Comparison of the relative information content of Executive Compensation and the Pay Ratio**

	N	CEO Compensation		Pay Ratio		Vuong's Z-statistic
		R <sup>2</sup>	R <sup>2</sup>	R <sup>2</sup>	R <sup>2</sup>	
Raw Values	1,063	0.0516	0.0122	4.229508197	1.8164*	
Logged Values	1,062	0.0981	0.0063	15.57142857	4.0754***	
Industry-Size Adjusted Raw Values	1,062	0.0067	0.0096	0.697916667	-0.3563	
Binary Indicator for Above Median Raw Values	1,054	0.0657	0.0021	31.28571429	3.7966***	

**Panel B: Comparison of the relative information content of Executive Compensation and Median Employee Compensation**

	N	CEO Compensation		Median Employee Compensation		Vuong's Z-statistic
		R <sup>2</sup>	R <sup>2</sup>	R <sup>2</sup>	R <sup>2</sup>	
Raw Values	1,054	0.0507	0.2449	0.207023275	-5.7205***	
Logged Values	1,054	0.0967	0.2229	0.433826828	-4.3437***	
Industry-Size Adjusted Raw Values	1,054	0.0071	0.0667	0.106446777	-3.4778***	
Binary Indicator for Above Median Raw Values	1,054	0.0657	0.1657	0.396499698	-4.0926***	

In all cases, except the case of Industry-Size adjusted values, Hypothesis 4(a) that the Pay Ratio is relatively more informative than Executive Compensation with respect to employee perceptions is not supported. In the case where Industry-Size adjusted values are used there is not a statistically significant difference in the R-squared values of regressing aggregate employee ratings on either Executive Compensation or the Pay Ratio. These results suggest that without additional contextual information such as industry and size of the company the Pay Ratio element of the disclosure as a single element is not more strongly associated with employee perceptions of compensation practices at the firm than the level of Executive Compensation. Information about the level of median employee compensation might impact employee perceptions, however the response of the employee might be related to assessments of vertical pay dispersion or horizontal pay dispersion. Since associations between median employee compensation and employee perceptions of the compensation practices at the company are likely to be highly dependent on the employee's position in the company relative to the median, no inferences are drawn from these tests about implications for employee reactions to vertical pay dispersion. Although this test does not provide insights related to the central question of this paper about vertical pay dispersion, these tests provide important insight into the information content of the Pay Ratio Disclosure more broadly.

In Table 5 Panel B the results of the comparisons of relative information content of the level of executive compensation and the level of median employee compensation are consistent with Hypothesis 4(a) that the level of median employee compensation is relatively more informative than executive compensation with respect to employee perceptions of compensation and benefits at the company. This result suggests that

information about median employee compensation despite presenting the compensation of only one rank and file employee and not the full distribution of pay within a company is strongly associated with employee perceptions of compensation practices in the company and therefore the median employee compensation component of the Pay Ratio Disclosure may provide useful insights for subsequent studies related to employees.

In the final set of analyses, I look at the incremental information content of each of the components of the Pay Ratio Disclosure with respect to employee perceptions of compensation practices at the company. Although the Pay Ratio was not relatively more informative than the level of Executive Compensation it is possible that the Pay Ratio is still useful in understanding employee perceptions as a supplemental disclosure. In order to test the incremental information content of the Pay Ratio and the level of median employee compensation I create a series of nested models using the three components and then evaluate the Chi-squared statistic to determine if the incremental information significantly improves the fit of the model. The results of the series of nested models are presented in Table 6. For each of the models presented, the various transformations of the values are presented on a separate line in the table.

In the nested regressions the coefficient on each of the additional components – Pay Ratio in Model (2) or Median Employee Compensation in Model (3) – is statistically significant when added to the baseline model regressing employee perceptions on CEO compensation. In a secondary test to validate the incremental information content of each of the additional components of the Pay Ratio Disclosure I analyze the results of the Chi-Squared statistic for each of the models against the baseline model. Untabulated results of the Chi-Squared tests are consistent with the findings from the analysis of the coefficients

**Table 6: Incremental Information Content of Pay Ratio Disclosure Components**

In order to test the incremental information content of each of the components of the Pay Ratio on employees' perceptions a series of nested models are tested wherein each of the elements of the disclosure is added sequentially to the other components. In this panel the coefficients for each of the components is presented.

Model	CEO Compensation	Pay Ratio	Median Employee Compensation	R <sup>2</sup>
(1) - Raw*	0.0019***			0.0507
(1) - Logged	0.1881***			0.0967
(1) - Industry Size Adjusted Raw	0.0532***			0.0071
(1) - Binary Above Median Raw	0.2536***			0.0657
(2) - Raw*	0.0219***	-0.0003***		0.1045
(2) - Logged	0.4562***	-0.3067***		0.2824
(2) - Industry Size Adjusted Raw	0.0751***	-0.0361***		0.0222
(2) - Binary Above Median Raw	0.4377***	-0.3073***		0.1277
(3) - Raw*	0.0107***		0.0056***	0.2716
(3) - Logged	0.1560***		0.3025***	0.2837
(3) - Industry Size Adjusted Raw	0.0897***		0.0000***	0.0756
(3) - Binary Above Median Raw	0.2073***		0.3770***	0.2075
(4) - Binary Above Median Raw	0.2876***	-0.1249***	0.3324***	0.215

\* For the raw values, the CEO Compensation variable is in millions of dollars and the Median Employee Compensation variable is in thousands of dollars for ease of interpreting the coefficients.

on the nested models, that the additional elements - median employee compensation and the Pay Ratio - are incrementally informative over existing executive compensation disclosures. Regardless of which transformations of the variables are used there is support for Hypothesis 4(b) that the Pay Ratio and the level of median employee compensation are incrementally informative over the level of executive compensation.

#### *4.5 Employee Reactions to the Pay Ratio Disclosure*

A difference-in-difference design is employed to assess employee reactions around the time that the Pay Ratio Disclosure was first disclosed in proxy statements in 2018 for 2017 calendar year end firms. Whereas the association tests were akin to capital markets long window value relevance studies, the following difference-in-difference design is akin to a capital markets short window information content study, although I still maintain a focus on assessing relevance for employees not shareholders.

The sample is partitioned based on whether the Pay Ratio was above or below the median and firms with a Pay Ratio above the median are considered the treated group. In addition to evaluating whether the raw value of the Pay Ratio is above the median, a similar process is followed to evaluate whether the firm has an above median Pay Ratio for the industry-size bucket. Firms with an above median Pay Ratio are assigned a value of one for the binary variable *HighPayRatio* (a value of one for *HighPR Ind Size Adj* for above median Pay Ratio for the industry-size bucket).

The dependent variable is the *IndividualRating* measure which captures the rating of compensation and benefits from a single employee review of the company. Data are drawn from the Glassdoor website and are not part of a survey design implemented by the

researcher, therefore the employees who rate the company in the pre-disclosure period and employees who rate the company in the post-disclosure period are unlikely to be the same employees. Although employees are not precluded from repeatedly rating the firm in the pre-disclosure and post-disclosure period, the employees in the pre-disclosure period and the post-disclosure period should be assumed to be two separate draws from the population of current and former employees at the company.

Unlike stock markets which have large amounts of daily activity, the number of reviews per day for a given company is a distribution with a large number of days with no reviews. Therefore instead of focusing my attention in the days around the disclosure I focus my attention over a period of months in order to obtain a large enough sample of employee reviews for each company. The proxy statements for most December 31<sup>st</sup> year end firms are released in March or April of 2018. I restrict my sample to companies that had disclosed the Pay Ratio in the Proxy Statement by the end of April. Employees may learn of the Pay Ratio at their firm either directly through the Pay Ratio Disclosure or indirectly through media. In 2018, the first year that the Pay Ratio Disclosure went into effect (nearly a decade after it was mandated by the Dodd-Frank Act), the new disclosure attracted a lot of attention from media nation-wide. Many national and local newspapers published stories stating the disclosed Pay Ratios. For the purposes of the difference-in-difference design the period between March 2018 and May 2018 is considered the disclosure period. The pre-disclosure period and post-disclosure periods are set as three month (six month) windows on either side of the disclosure period.

Although there was a lot of media and political attention on the disclosed Pay Ratios it is unclear ex ante if the newly disclosed Pay Ratios are relevant to the population of rank-



and-file employees. If vertical pay dispersion is not a part of employees' utility function then the level of pay dispersion would have no impact on employees' perceptions of a firm. Even if the level of vertical pay dispersion within a firm is relevant to overall employees' perceptions of the firm as demonstrated in the association tests, it is unclear ex ante whether the Pay Ratio Disclosure will be informative to employees or if they have sufficient information about compensation levels in the firm even in the absence of the disclosure. It is unclear ex ante that a measure of vertical pay dispersion with the CEO as one referent and the median employee, a single draw from the population of rank-and-file employees, as the other referent will be relevant information to the broad population of rank-and-file employees.

The results of the difference-in-difference design described in Equation (5) are reported in Table 7. Columns (1) through (4) contain the results for the three month pre-disclosure and post-disclosure windows for capturing the compensation and benefits sub-ratings in individual reviews on Glassdoor. In the case where the treatment variable is a binary variable indicating the Pay Ratio for the firm is above the median value for all companies without respect to industry or size as the treatment group, presented in columns (1) and (2), the coefficient on the interaction term is negative as anticipated, but not statistically significant. When the binary variable for treatment is set to one for companies with a Pay Ratio above the median value for their industry-size bucket (Columns (3) and (4)) the coefficient on the interaction term is negative and statistically significant. This result is consistent with Hypothesis 5 that employee perceptions of compensation and benefits at a company are more negative after the Pay Ratio Disclosure for companies with a Pay Ratio that is above median for their industry-size group. The pre-

**Table 7: Individual Ratings around the Pay Ratio Disclosure**

This table reports results of the difference-in-difference design described in Equation (5) to evaluate employee reactions (*IndividualRating*) to above median Pay Ratios around the time the Pay Ratio was first disclosed in 2018. See Appendix C for variable definitions. Statistical significance of the reported coefficients is based on standard errors clustered by industry. \*\*\*, \*\* and \* represent significance at the 1%, 5% and 10% level, respectively.

$$\text{IndividualRating} = \beta_0 + \beta_1 \text{HighPayRatio} + \beta_2 \text{Post} + \beta_3 \text{HighPayRatio} * \text{Post} + \Sigma \beta_k \text{Controls} + \varepsilon$$

	Predicted			Three-month window			Six-month window		
	Sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>HighPayRatio</i>	-	-0.0909 (-0.45)	-0.0009 (-0.01)			-0.0695 (-0.46)	0.0108 (0.09)		
<i>Post</i>	+	0.0766* (1.68)	0.0851** (1.79)			0.135** (3.30)	0.141*** (3.39)		
<i>HighPayRatio*Post</i>	-	-0.0345 (-0.73)	-0.0425 (-0.85)			-0.0994* (-2.31)	-0.106* (-2.42)		
<i>HighPR Ind Size Adj</i>	-			-0.201*** (-2.63)	-0.1630** (-2.61)			-0.183 (-2.76)	-0.151* (-2.69)
<i>Post</i>	+			0.0923*** (3.85)	0.0890*** (3.72)			0.0830*** (4.20)	0.0803*** (4.12)
<i>Post*HighPR Ind Size Adj</i>	-			-0.0615** (-2.16)	-0.0557* (-1.93)			-0.0436** (-1.69)	-0.0400* (-1.56)
<i>Ln.Assets</i>		0.0769*** (2.25)	0.0486** (1.48)	0.0843*** (2.57)	0.0641*** (2.20)	0.0836*** (2.78)	0.0642*** (2.26)	0.0885*** (3.13)	0.0763*** (3.06)
Controls		No	Yes	No	Yes	No	Yes	No	Yes
Industry Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Ratings		50,091	49,917	46,914	46,740	112,287	111,816	105,446	104,975
Adj R-Squared		7.7%	8.3%	8.8%	9.3%	7.4%	7.9%	8.2%	8.7%

disclosure and post-disclosure period within which employee ratings are observed are expanded from three months to six months and the results are presented in Columns (5) to (8). I find results consistent with Hypothesis 5 for treatment groups defined with or without respect to the industry-size bucket. These findings are robust to the omission or inclusion of the set of control variables used for Equations (1) and (2). Employee perceptions of firms with high levels of vertical pay dispersion are more negative than perceptions of firms with low levels of vertical pay dispersion in the period after the Pay Ratio Disclosure went into effect. This effect is above and beyond the negative association between perceptions and the Pay Ratio documented in the pre-disclosure period and despite the overall increasing trend in ratings during the entire time period covered.

## **V. CONCLUSION**

The central question addressed by this paper is whether employee perceptions of the firm are impacted by the level of vertical pay dispersion and whether the Pay Ratio Disclosure is relevant as a measure of the level of vertical pay dispersion. The principal finding of these analyses is that the Pay Ratio, the level of vertical pay dispersion companies must disclose as a result of the Dodd-Frank Act, is a relevant disclosure under the assumption that employees are a potential user group and from the perspective of researchers and stakeholders who want to assess the relevance of vertical pay dispersion for employee related outcomes. In the pathway proposed, I first look at whether and how the overall level of vertical pay dispersion within a firm is associated with employee perceptions of the firm. In the first set of analyses I assess the association between vertical pay dispersion and overall employee perceptions of the firm for a cross-section of firms.

The overall negative relation between high levels of pay dispersion and employee ratings of the compensation and benefits practices of the firm is consistent with Equity Theory, in particular that employees perceive high levels of vertical pay dispersion as unfair. Support for the contention that Equity Theory dominates Tournament Theory is also found in the difference-in-difference design measuring employee perceptions around the time the Pay Ratio Disclosure was first implemented. I find that high levels of the Pay Ratio are negatively associated with employee perceptions in the post-disclosure period.

In the proposed pathway, for vertical pay dispersion to be associated with future firm outcomes, vertical pay dispersion must be associated with quantifiable impacts on firm performance. Beyond expressions of perceptions in online ratings of the firm, I find that high levels of vertical pay dispersion are associated with lower firm-level productivity. The observed negative relation between high levels of vertical pay dispersion and firm-level productivity are consistent with Equity Theory and imply that employees do not simply express their perceptions in online ratings, but also that their perceptions have a quantifiable impact on job performance.

In order to further assess whether the findings are consistent with prior literature and to understand some of the dimensions of compensation practices that might impact the negative relationship between high pay dispersion and employee perceptions, I investigate whether performance-based variable pay has a moderating effect on the observed negative relationship. Prior literature in management and economics has demonstrated that the structure for determination of pay can impact employees' perceptions of fairness. I focus on elements of pay that are based on performance – bonuses, profit sharing and commissions - and find that higher levels of performance – based variable pay are

associated with more muted negative perception of high levels of pay dispersion. This moderated relationship is consistent with Equity Theory under the assumption that when employees understand the basis for compensation they are more likely to perceive that compensation as fair.

The final set of analyses is designed to assess the information content of the novel elements of the Pay Ratio Disclosure. The objective is a general assessment of whether this novel disclosure contains information relevant to employees beyond existing disclosures of executive compensation. If executive compensation is the main driver of the Pay Ratio, i.e. the Pay Ratio is predominantly driven by the numerator, then it is possible that all the information relevant to employees can be gleaned from existing disclosures. I find that the level of median employee compensation – one of the three quantitative elements of the Pay Ratio Disclosure – is relatively more informative than executive compensation levels with respect to employee perceptions of the firm. I find that both the level of median employee compensation and the Pay Ratio are incrementally informative over existing disclosures of executive compensation with respect to employee perceptions. Therefore insofar as employees are considered a relevant user group or insofar as other stakeholders are concerned about how employee perceptions of the firm might impact future firm performance, the Pay Ratio Disclosure is informative, relatively and incrementally, over existing disclosures of executive compensation.

In conclusion, I present these analyses as my contribution to a growing body of accounting literature that investigates the role of employees as a valuable source of information about the overall health of the firm and as a part of the literature that discusses the important role of employees as a driver of firm value.

## REFERENCES

- Akerlof, G. and J.L. Yellen. 1990. The Fair Wage-Effort Hypothesis and Unemployment. *The Quarterly Journal of Economics*, 105(2), 255–283.
- Breza, E., S. Kaur and Y. Shamdasani. 2017. The Morale Effects of Pay Inequality. *The Quarterly Journal of Economics*, 133(2), 611–663.
- Cheng, Q., T. Ranasinghe and S. Zhao. 2017. Do High CEO Pay Ratios Destroy Firm Value? Working Paper, July 2017.
- Crawford, S., K. Nelson and B. Rountree. 2017. Mind the Gap: CEO-Employee Pay Ratios and Shareholder Say-on-Pay Votes. Working Paper, August 2018.
- Dechow, P. 1994. Accounting Earnings and Cash Flows as Measures of Firm Performance: The Role of Accounting Accruals. *Journal of Accounting and Economics*, 18(1), 3–42.
- Downes, P. E. and D. Choi. 2014. Employee Reactions to Pay Dispersion: A Typology of Existing Research. *Human Resource Management Review*, 24(1), 53–66.
- Financial Accounting Standards Board (FASB). September 2010. Statement of Financial Accounting Concepts No. 8. Retrieved from [fasb.org](http://fasb.org).
- Hales, J., J. Moon and L. Swenson. 2018. A New Era of Voluntary Disclosure? Empirical Evidence on How Employee Postings on Social Media Relate to Future Corporate Disclosures. *Accounting, Organizations and Society*, Forthcoming.
- Kepes, S., J. Delery and N. Gupta. 2009. Contingencies in the effects of pay range on organizational effectiveness. *Personnel Psychology*, 62(3), 497–531.
- Lazear, E. and S. Rosen. 1981. Rank-Order Tournaments as Optimum Labor Contracts. *Journal of Political Economy*, 89(5), 841–864.
- Phan, J. CEO Pay Ratio: A Deep Data Dive. *Harvard Law School Forum on Corporate Governance and Financial Regulation* (May 31, 2018)
- Rouen, E. 2019. Rethinking Measurement of Pay Disparity and its Relation to Firm Performance. *The Accounting Review*, Forthcoming.
- Securities and Exchange Commission. Letter Type D. (August 22, 2018) Retrieved from [sec.gov](http://sec.gov).
- Shaw, J and N. Gupta. 2007. Pay System Characteristics and Quit Patterns of Good, Average, and Poor Performers. *Personnel Psychology*, 60(4), 903–928.
- Vuong, Q. H. 1989. Likelihood Ratio Tests for Model Selection and Non-nested Hypotheses. *Econometrica*, 57(2), 307–333.

## APPENDIX A: GLASSDOOR.COM SCREENSHOTS

The following screenshot is an example of what the review posting page looks like on the Glassdoor.com website. For illustrative purposes, random ratings are selected in the screenshot below. All ratings are based on a 5-point scale and the participants can choose between one and five stars. The Compensation and Benefits rating is the basis for the *OverallRating* and *IndividualRating* variables used in the regression analyses as a measure of employee perception of the firm.

### Ratings (Optional)

#### Career Opportunities



#### Compensations & Benefits



#### Work/Life Balance



#### Senior Management



#### Culture & Values



---

#### Rate CEO Job Performance



*Disapprove*

---

#### Recommend to a friend?



*Positive*

---


#### 6 Month Business Outlook



*No Opinion*

## APPENDIX B: Payscale.COM SCREENSHOT

The following screenshot is an example of what the compensation reporting page looks like on the Payscale.com website. The amounts entered in the “Additional Compensation” section in the bottom half of the screen including bonus, profit sharing and sales commission are the variable compensation values that comprise the *PerformancePay* variable.



### Your Pay

To accurately assess your value in the marketplace, please let us know more specifics about how you are paid. The more precise your answers are, the more informative your salary report will be.

**Pay type**

Annual Salary  
 Hourly Rate  
 This Is Not My Job

**Annual base salary**  USD

**Salary reported is for**

**Additional Compensation**

Bonus

**Annual bonus**  USD

Cash Profit Sharing

**Annual profit share (disbursed to you)**  USD

Commission on Sales

**Annual sales commissions**  USD

**Annual sales volume (gross sales)**  USD

[Next](#)



## APPENDIX C: VARIABLE DEFINITIONS

Variable	Definition
<i>OverallRating</i>	Firm-level value of the Compensation and Benefits rating from the Glassdoor.com website. Individual employees choose an integer rating between one and five. Values used are firm level-averages. Measured on April 18, 2018 containing the equal weighted average of ratings posted between 2009 and April 2018. See screen shots from the website in Appendix A.
<i>Productivity</i>	The natural log of net income per employee based on the Net Income from the 2017 fiscal year and the number of employees disclosed in the Pay Ratio Disclosure associated with the 2017 fiscal year. Loss firms are excluded.
<i>IndividualRating</i>	Integer rating between one and five of the firm's compensation and benefits rating from an individual review on the Glassdoor.com website. See screen shots from the website in Appendix A.
<i>Ln Pay Ratio</i>	The natural log of the Pay Ratio as presented in the Pay Ratio Disclosure in the 2017 fiscal year proxy statement available in 2018
<i>Pay Ratio Ind Size Adj</i>	First industry-size portfolios are created based on two digit SIC industry code partitioned into size five quintiles in each industry. The industry-size adjusted Pay Ratio is then calculated by taking the Pay Ratio for the firm minus the median Pay Ratio for the industry-size portfolio and dividing it by the median Pay Ratio for the industry-size portfolio for scale.
<i>PerformancePay</i>	The mean dollar value of variable compensation within a firm multiplied by the proportion of employees who report receiving variable compensation. Measured on June 1, 2018.

Variable	Definition
HighPayRatio	A binary variable based on the raw Pay Ratio variable presented in the Pay Ratio Disclosure that takes a value of 1 if the Pay Ratio for a firm is greater than the median Pay Ratio for all firms in the sample, 0 otherwise.
HighPR Ind Size Adj	A binary variable based on the <i>Pay Ratio Ind Size Adj</i> variable that takes a value of 1 if the Pay Ratio is above the median for the industry-size portfolio, 0 otherwise.
<i>Ln Assets</i>	Natural log of assets at year end 2017.
<i>ROA Var</i>	The standard deviation of the Return on Assets (Net Income/Total Assets) for the firm for the past 5 years.
<i>RET</i>	Buy and hold abnormal return for calendar year 2017.
<i>RET Var</i>	Standard deviation of daily returns over the time period 2013-2017.
<i>BTM</i>	Book value of equity divided by market value of equity as of year end 2017.
<i>CAPEX</i>	Capital Expenditures for the 2017 fiscal year scaled by Sales.
<i>LEV</i>	Total debt divided by book value of equity as of year end 2017.
<i>HHI</i>	Herfindahl-Hirschman index defined as the sum of the squares of market share of sales for each firm in an industry.
<i>LOSS</i>	Binary variable which takes a value of 1 if the net income for fiscal year 2017 was less negative and takes a value of 0 otherwise.

Note: All variables are winsorized at the 1<sup>st</sup> and 99<sup>th</sup> percentiles except *OverallRating*, *IndividualRating* and binary variables.