



# A path analysis investigation of the relationships between CEO pay ratios and firm performance mediated by employee satisfaction

May Xiaoyan Bao<sup>a</sup>, Xiaoyan Cheng<sup>b</sup>, David Smith<sup>c,\*</sup>

<sup>a</sup> University of New Hampshire, Durham, NH 03824, United States of America

<sup>b</sup> University of Nebraska-Omaha, Omaha, NE 68182, United States of America

<sup>c</sup> University of Nebraska-Lincoln, CBA 392, Lincoln, NE 68588-0488, United States of America

## ARTICLE INFO

### Article history:

Received 1 March 2019

Received in revised form 13 February 2020

Accepted 17 February 2020

Available online 26 February 2020

### Keywords:

Fairness of CEO pay dispersions

Employee satisfaction

Firm performance

## ABSTRACT

We posit that information about CEO pay ratios is important to investors because employees' perceived fairness of their firm's CEO pay ratio has consequences for firm performance. We use path analysis to examine the association between firm performance and (1) the predicted CEO pay ratio as determined by economic factors (the fair component of CEO pay ratio) and (2) the predicted CEO pay ratio as determined by non-economic factors (the unfair component of CEO pay ratio). We test for the existence and relative importance of direct and indirect paths using two measures of employee satisfaction and two measures of firm performance. We find that pay equity, a larger CEO pay ratio driven by economic factors, is associated with employee contributions to better firm performance. Conversely, we show that pay inequity, a larger CEO pay ratio driven by non-economic factors, is associated with employees' contributions to poorer firm performance. Consistent with the view that managerial entrenchment may amplify the negative effects of the CEO pay ratio, we find that the negative indirect path between pay inequity and firm performance, mediated by employee satisfaction, is more pronounced in firms with entrenched CEOs. Our findings contribute to the accounting compensation literature because they are consistent with CEO pay ratio information having economic consequences.

© 2020 Elsevier Ltd. All rights reserved.

## 1. Introduction

The consequences of pay dispersion have become more topical with the passage of the Dodd-Frank Act and its requirement for the disclosure of the ratio between CEO pay and median company employee pay (hereafter, CEO pay ratio). We argue CEO pay ratio disclosure is important to investors because it contains information that may have implications for firm performance through its impact on employee job satisfaction. We reason that the CEO pay ratio has intuitive appeal to investors by providing median employee pay as a salient benchmark that they can use to provide insight into employees' evaluation of the fairness of CEO compensation (Kelly & Seow, 2016). Past equity theory research supports our argument and delineates predictions about how employees' satisfaction relates to their positive or negative judgments about the fairness of the size of the CEO pay ratio. The previous research bases its predictions on the equity theory principle that lower-level employees deem their firms' CEO pay ratio to be equitable and in everyone's self-interest (e.g., "fair") if the ratios of inputs (e.g., skills, experience, knowledge, and abilities) and outcomes (e.g., compensation and perks) are similar for all the interacting subjects (Homans, 1961;

Walster, Berscheid, & Walster, 1978). Other research from literature on stakeholder theory, distributive justice, and social comparison theory supports the predictions of equity theory and suggests that employees' judgments about how fairly they are treated by their firms (e.g., their level of satisfaction) directly affects their willingness to work hard to achieve successful firm performance (Bamberger, Biron, & Meshoulam, 2014; Bobocel & Gosse, 2015; Cowherd & Levine, 1992; Edmans, 2011, 2012; Festinger, 1954).

Proponents of the CEO pay ratio disclosure argue the CEO pay ratio disclosure is needed because it provides useful information. However, their conclusions about the CEO pay ratio's usefulness are not unanimously held among members of the business community. For example, at least one SEC Commissioner claims the ratio's only usefulness is to "wrongfully shame CEOs" (Statement by Commissioner Michael Piwowar at Open Meeting Regarding Municipal Advisors and Pay Ratio Disclosure, September 18, 2013). Past mixed conclusions about the CEO pay ratio's usefulness, along with the increased disclosure requirements for CEO pay ratios from Congress and the Securities and Exchange Commission (SEC), motivates the need for our investigation. The question addressed in our paper is the following: *How do employees' perceptions about the fairness of their firm's CEO pay ratio impact firm performance?* In this study we use the term "CEO pay ratio" to refer to vertical pay dispersion. Vertical pay dispersion is defined as "pay differences between

\* Corresponding author.

E-mail address: [Dsmith19@unl.edu](mailto:Dsmith19@unl.edu) (D. Smith).

employees in jobs at different hierarchical levels" (Trevor, Reilly, & Gerhart, 2012: p.586).

Our paper differs from previous research in several important ways. First, we have chosen to use path analysis (see Fig. 2) because it allows us to separately investigate direct and indirect paths between pay fairness and firm performance. We hypothesize a direct path between pay fairness (pay equity and pay inequity) and firm performance as indicated by a vast amount of research in management, finance and accounting. Our investigation of the positive relation between pay equity and firm performance provides evidence for confirming the predictions of tournament theory. Evidence of a negative relation between pay inequity and firm performance provides evidence for confirming the predictions of the managerial rent-seeking literature. We hypothesize employee satisfaction to have an indirect or mediating effect on the relationships between firm performance and pay fairness (pay equity and pay inequity). Our review of the CEO pay ratio literature suggests employee satisfaction's indirect, mediating effect between pay fairness and firm performance has up to this point escaped investigation and so we believe that our study fills the void in the CEO pay ratio literature. Our results support the argument that posits an indirect link, in which employee satisfaction is a mediator variable that is influenced by pay fairness and that, in turn, impacts firm performance. We provide evidence on how the relation between pay fairness and firm performance operates and how this relationship is attributable to an indirect path. Our choice to incorporate the influence of managerial entrenchment in our path analysis is the second way our study differs from previous research. The debate surrounding the disclosure of the CEO pay ratio indicates the direct and indirect effects of managerial rent seeking are particularly important to proponents of the ratio's disclosure. Our findings suggest that the negative effect of pay inequity on firm performance through employee satisfaction is more pronounced in an entrenched management environment. The findings of our path analysis shed light on the nature of the association between pay fairness and firm performance that provides support for the increased CEO pay ratios disclosure requirements from Congress and the Securities and Exchange Commission (SEC).

Our empirical analysis is divided into three parts. First, we confirm the direct paths found in past research between firm performance and pay fairness (pay equity versus pay inequity). We follow Rouen's (2020) approach by using the CEO pay ratio attributable to economic factors such as performance and labor market characteristics as a proxy for pay equity and the CEO pay ratio attributable to non-economic factors as a proxy for pay inequity. Our findings in this part of our study are consistent with our theory. We show that pay equity, a larger CEO pay ratio due to economic factors, is associated with employee contributions to better firm performance. Conversely, we show that pay inequity, a larger CEO pay ratio driven by non-economic factors, is associated with employees' contributions to poorer firm performance. In the second part of our study, our indirect path analysis provides the structure for empirically testing our study's hypotheses. We investigate the effects of CEO pay fairness on employee satisfaction, which in turn may facilitate or dampen firm performance. We examine whether the indirect path going through employee satisfaction is dependent on a situational factor, managerial entrenchment. We focus on managerial entrenchment because CEO entrenchment causes a disproportionate allocation of rents to CEOs, which may lead employees to conclude that the CEOs use entrenchment power to increase benefits for themselves as reflected by higher CEO pay ratios (Core, Holthausen, & Larcker, 1999). To test our hypothesis, we partition our sample into a low and high entrenchment subsample using a composite measure of managerial entrenchment that includes Bebchuk, Cohen, and Ferrell (2009)'s entrenchment index (*EINDEX*) and an indicator variable capturing whether the CEO is also the firm's board chairman (*CHAIR*). We then compare the impact of pay inequality for high versus low entrenchment firms, mediated by employee satisfaction, on firm performance. Consistent with the view that managerial entrenchment may

amplify the negative effects of CEO pay ratio, we find that the negative correlation between pay inequity and firm performance attributable to the indirect link through employee satisfaction is more pronounced in firms with more entrenched CEOs. Our results suggest employee perception of pay inequity is a contributing factor to explain why firms with entrenched CEOs suffer from poorer performance in the presence of high CEO pay ratios.

In the last part of our analysis, we conduct further investigation in a setting that requires substantial employee interaction and cooperation. Past researchers posit the success of firms in high-tech industries depends more on the ability of employees at all levels to collaborate, interact, and share ideas than for firms where new knowledge is not as important (Henderson & Fredrickson, 2001; Siegel & Hambrick, 2005; Simmons, 2006). Our findings in the high-tech industry setting confirm our main findings. We show that the positive (negative) indirect link between pay equity (pay inequity) and firm performance that is mediated by employee satisfaction, becomes more important in high-tech firms.

The strength of our path analysis results depends on our measures (1) capturing employees' knowledge of their firms' pay fairness and (2) capturing employees' satisfaction. We capture employees' knowledge of their firms' pay fairness by first calculating the CEO pay ratio in the same way it is calculated on the popular AFL-CIO's Executive Paywatch website<sup>1</sup> and then separating CEO pay ratio attributable to economic factors from CEO pay ratio attributable to non-economic factors. We capture employees' satisfaction by using an employee satisfaction metric employed in past research investigating the link between companies' employees' satisfaction and firm performance (Edmans, 2011, 2012). The satisfaction metric is derived from the list of the "Forbes Magazine 100 Best Companies to Work for in America."

Our paper makes several important contributions to the academic literature and to current policy debates. First, our examination of employees' perceived pay fairness responds to a call by Murphy (1999) to provide an understanding of the consequences of the growing CEO pay ratio. Our findings augment and complement research conducted in several areas (accounting, strategic management, economics, and industrial relations) aimed at resolving the theoretical inconsistencies between CEO pay ratio and organizational performance (Ding, Akhtar, & Ge, 2009; Shaw, Gupta, & Delery, 2002). We extend Trevor et al. (2012) and Rouen (2020) to posit that input-based distinctions stemming from economic or non-economic factors help resolve inconsistencies in prior studies by documenting an indirect effect of pay fairness on firm performance through employee satisfaction. Our results suggest that employee satisfaction is a significant channel through which pay fairness may facilitate or hamper firm performance. Second, our study brings forward existing knowledge by accessing the role of pay fairness on firm performance via employee satisfaction in the context of managerial entrenchment. Our results support the argument that pay inequity was found to be reflective of agency conflict, particularly in firms with entrenched CEOs. We also provide evidence that high-tech employees are able to critically evaluate the reasonableness of the CEO's pay ratio. Finally, our findings should be of interest to compensation committees and regulators. Our results suggest that companies may need to assess the appropriateness of their pay structure and consider how to manage pay fairness perceived by employees.

The remainder of the paper is divided into five parts. Part 2 is our hypothesis development. This is followed by Part 3 describing our methodology. Parts 4 and 5 contain our sample selection and our results. We finish with our conclusions in Part 6.

<sup>1</sup> AFL-CIO's Executive Paywatch uses a CEO pay ratio calculation methodology endorsed by the Securities and Exchange Commission (SEC) Release No. 33-9452 (2013).

## 2. Background and hypothesis development

### 2.1. Stakeholder theory and distributive justice implications for evaluating pay fairness

We begin our theoretical argument by integrating stakeholder theory into a classic distributive justice theoretical model framework. Our stakeholder groups include the CEO, employees and shareholders. Shareholders are represented in our model by the board of directors, though we suggest that the board of directors may at times be a stakeholder group that acts in its own interest, independently of shareholder interest.

We make several assumptions about the pool of resources available to be distributed to stakeholders that are consistent with employees' relative assessments of their compensation with regard to the CEO's compensation (Cowherd & Levine, 1992; Guo, Libby, & Liu, 2017). First, we follow past research in stakeholder theory to assume a synergistic relationship between the CEO and employees stakeholder groups in the creation of firm value that generates the pool of resources to be distributed to stakeholders (Tantalo & Priem, 2016). This assumption leads to the conclusion that employees view the quantity of total compensation funds available for distribution to be dependent upon the success of the CEO's leadership ability, combined with the cooperative toil by the firm's labor force. It implies that top talent CEOs are viewed by the employee stakeholder group as potentially expanding the pool of resources available to all stakeholders. Second, we assume that everyone is paid from the same pool of funds so that a firm's work force members judge more paid to one member of the work force (including the CEO) to imply less remaining for others. As a result, there are strong incentives for all stakeholders to monitor other stakeholders to ensure the pool of resources is divided fairly. Third, we assume stakeholders prefer equity as a strategic choice in dividing the pool of resources in order to maximize their individual utilities (Montada & Maes, 2016: p.111). According to past equity theory research, employees believe an exchange relationship to be equitable and in their self-interest if the ratio of inputs (e.g., skills, experience, knowledge, and abilities) and outcomes is similar for all the interacting subjects (Homans, 1961; Walster et al., 1978). The equity theory view of self-interest implies that employees formulate informal rules related to their expectations of the contributions of other stakeholders such as the CEO when judging the fairness of the division of the pool of available resources (Parmar et al., 2010). It also suggests that stakeholders from the employees' group use their informal frameworks to carefully monitor other stakeholders such as the CEO. Finally, consistent with the relative world view we are emphasizing in this paper, our third assumption implies a relative view of fairness among employee/stakeholders about their compensation.

We construct a model in Fig. 1 to show the distributive justice implications of this relative perspective of CEO pay ratio. Our distributive justice model is taken from Jasso, Törnblom, and Sabbagh (2016) and contains three actors (Allocator, Observer, and Rewardee) and four key terms (Actual Reward, Just Reward, Justice Evaluation and Justice Consequence). Allocator of the Actual Reward (e.g., actual CEO Pay ratio) is the board of directors that normally represents the shareholder stakeholders.

Observers in our Fig. 1 model are the employee stakeholder group. These employees determine the Just Reward (e.g., the fair component of CEO pay ratio), using reasoning processes that are consistent with equity theory and based on their knowledge from monitoring the CEO's strategic leadership success in accomplishing corporate goals. The Observers (i.e., employees) then perform Justice Evaluations that involve comparisons of the Actual Reward with the Just Reward. Though Observers/Employees may not fit the definition of insiders, our model's assumptions suggest these employees are highly motivated to acquire sufficient knowledge to judge whether the actual CEO pay ratio results from his/her strategic leadership success that would be in agreement with equity theory.

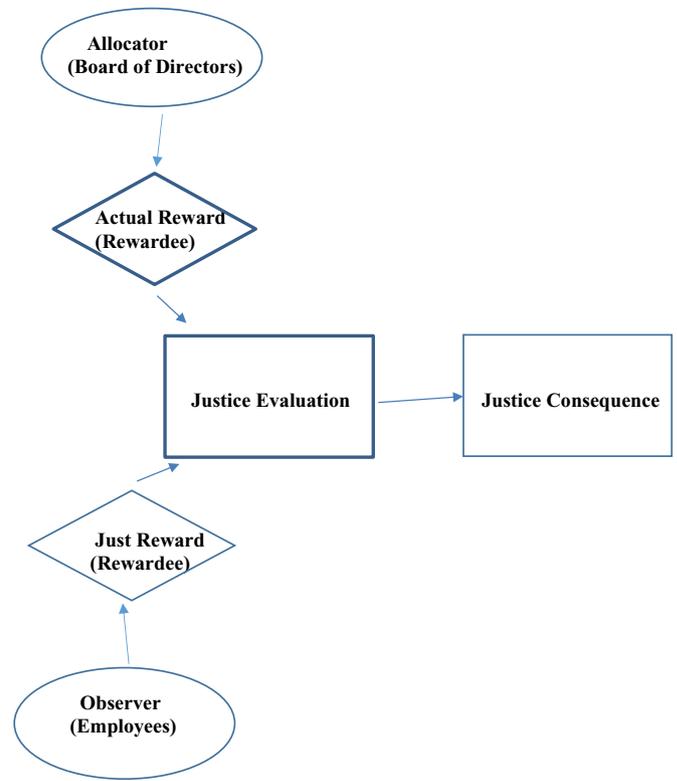


Fig. 1. Distributive justice model for determining CEO - rewardee pay ratio.

### 2.2. Stakeholder theory, tournament theory, and distributive justice implications for evaluating the relationship between pay fairness and firm performance when CEO pay ratio derives from economic factors

The compensation literature (Bebchuk, Cremers, & Peyer, 2011; Bloom & Michel, 2002) shows that CEO pay ratio is heavily influenced by a firm's economic conditions, such as size, leverage, growth opportunities and diversification. For example, Core et al. (1999) use firm size as a proxy for CEO talent, suggesting that CEOs in larger firms receive a pay premium. Studies on compensation research (Gerhart & Rynes, 2003; Lazear, 2000; Trevor et al., 2012) conclude that high CEO pay ratio is indicative of competitive sorting scheme that enables the company to link pay to inputs that yield advantages in attracting and retaining talented CEOs. A significant body of empirical research has uncovered evidence in favor of tournament theory's premise regarding the potential positive associations of CEO pay ratio with firm performance (Cappelli & Cascio, 1991; Connelly, Haynes, Tihanyi, Gamache, & Devers, 2016). The tournament theory predicts that participants' level of effort increases with the differences in pay between organizational levels. Under this view, employees are inspired by promotion for high level positions and thereby exert greater effort and commitment to organizational priorities (Becker & Huselid, 1992). In our study, we posit that integrating tournament theory with stakeholder and distributive justice theory provides deeper insight into the consequences of pay fairness.

Our distributive justice model in Fig. 1 lends itself to describing the Justice Consequences to CEO pay ratio driven by economic factors. Consistent with equity theory, we argue that the Actual Reward is perceived by the Allocators to be monotonically increasing with the differential inputs in terms of productivity and human capital between CEOs and employees as larger differential inputs are used to attract talented CEOs (Cowherd & Levine, 1992). In addition, equity theory makes the same prediction that Just Reward is perceived by the Observers to be monotonically increasing with the differential inputs between CEOs and employees. Referring to Fig. 1, this consistency implies an employee/

Observer's Justice Evaluation of higher employee satisfaction. Finally, higher employee satisfaction implies a Justice Consequence of greater employee cooperative effort that mediates the outcome by pay equity to achieve even higher firm performance. Our argument leads to our first hypothesis stated as follows:

**H1.** : Employee satisfaction positively mediates the path between pay equity and firm performance.

### 2.3. Stakeholder theory, equity theory, and distributive justice implications for evaluating the relationship between pay fairness and firm performance when CEO pay ratio derives from non-economic factors

Alternatively, past stakeholder theory, equity theory, and relative deprivation theory research shows that a Justice Consequence (see Fig. 1) may be that employees respond more negatively, the more the CEO is unfairly "taking a bigger piece of the pie". This behavior is consistent with the prediction that employees' perceptions of inequity grow as the employees realize the ratio of inputs to outcomes increasingly favors the CEO at their expense. This perception is associated with poor employee morale, job satisfaction, productivity, and cooperation among employees (Cowherd & Levine, 1992; Homans, 1961; Montada & Maes, 2016; Wade, O'Reilly, & Pollock, 2006; Walster et al., 1978).

Employee dissatisfaction is a consequence of a conflict between the Actual Reward chosen by the Allocator/board of directors and the Just Reward identified by the Observer/ Employees. The Actual Reward chosen by the Allocator/board of directors is likely to be influenced by non-economic factors such as rent extraction by entrenched CEOs, while the Just Reward ascertained by the Observer/Employees is likely to have no relationship with non-economic factors. The conflict results between the Allocator and Observer judgments because members of the board of directors (Allocators) may personally benefit from cooperating with the CEO and providing the CEO with undeserved rewards. Observer/Employees respond negatively to CEO pay ratio driven by non-economic factors because they are potentially injured as the size of the CEO pay ratio grows without expanding the wage pool. Referring to Fig. 1, past research in distributive justice and equity theory suggests that this conflict between the Actual Reward and Just Reward results in a Justice Evaluation that the Actual Reward is unfair and therefore leads the employee/Observer to experience deprivation and a sense of inequity (Akerlof & Yellen, 1988; Ferraro, Pfeffer, & Sutton, 2005; Shaw et al., 2002). Consistent with past research, higher employee dissatisfaction implies a Justice Consequence of lower employee cooperative effort and commitment that mediates the outcome by pay inequity to achieve even lower firm performance. Our argument leads to our second hypothesis stated in the alternative form as follows:

**H2.** : Employee satisfaction negatively mediates the path between pay inequity and firm performance.

## 3. Methodology

### 3.1. Calculation of each firm-year CEO pay ratio explained by (1) economic factors and (2) non-economic factors

#### 3.1.1. Model for disaggregating CEO pay ratio

We follow guidance found in SEC Release No. 33-9452 (2013) to calculate the annual CEO pay ratio for each firm in our sample. This guidance states:

....the [annual] earnings of U.S. workers in various "industries" are publicly available from the Bureau of Labor Statistics. Therefore, investors may be able to approximate the ratio using the

industry median employee compensation and the information about CEO compensation for the registrants subject to Item 402(c) (SEC Release Nos. 33-9452, p. 87).

In footnote 151 of SEC Release No. 33-9452 the SEC is even more specific in its guidance:

The ratios in the figure [in the example found in SEC Release No. 33-9452] are calculated for each registrant with executive total compensation data from the Standard and Poor's COMPUSTAT Executive Compensation database which tracks compensation for the companies currently or previously in the S&P 1500 index and industry median employee wage information at each 3-digit NAICS level from the U.S. Department of Labor's Bureau of Labor Statistics (available at <http://www.bls.gov/bls/wages.htm>) (SEC Release Nos. 33-9452, p. 87).

We follow this guidance to calculate CEO pay ratios. Our CEO pay ratios are estimated exactly as described in footnote 151 for our variable *RAW\_PAYRATIO*.<sup>2</sup> Because *RAW\_PAYRATIO* is skewed we use the natural logarithm of *RAW\_PAYRATIO* in our analysis, which we call *PAYRATIO*.

Our next step is to disentangle each firm-year CEO pay ratio driven by economic factors from non-economic factors. We use variables identified in past finance, management and accounting research to construct model 1 (Bloom & Michel, 2002; Connelly et al., 2016; Core & Guay, 1999; Rouen, 2020). The economic factors include firm characteristics and labor market characteristics that influence the CEO pay ratio. We also include a dummy variable year to control for firm-fixed effects.

$$PAYRATIO = \alpha_0 + \sum_{j=1}^k \alpha_{jit} (Firm\ Variables, Labor\ Market\ Variables) + Year\ Dummies + \varepsilon \quad (1)$$

To proxy pay equity (*P\_RATIO*), we estimate the predicted CEO pay ratio in each sample firm-year that are explained by economic conditions. Pay inequity (*R\_RATIO*), measured using the residuals in model 1, the unexplained CEO pay ratio, represents the deviations from the expected level.

#### 3.1.2. Variables for firm characteristics

We include a comprehensive list of firm characteristics from the prior literature that might influence the CEO pay ratio. We first include industry wide pay ratio (*IND\_MEDIAN*), the median pay ratio of other firms in the same two-digit industrial group, because CEO pay ratio is set by a compensation committee that hires consultants to conduct analyses on the pay levels of other CEOs in peer group companies. We use the firm's return on assets (*ROA*) and annual stock market return (*RETX*) as a measure of firm performance. We expect CEOs in firms with better firm performance to have higher pay ratios. Firm risk is a proxy for the firm's information and operating environment. For example, Cyert, Kang, Kumar, and Shah (1997) finds that CEO compensation is positively associated with stock return volatility. We measure firm risk as the standard deviation of return on assets (*STD\_ROA*) and the standard deviation of annual stock returns (*STD\_RETX*) over the previous five years.

Consistent with prior literature (Core et al., 1999; Smith & Watts, 1992; Yermack, 1995), we expect larger firms, firms with greater growth opportunities, and firms with more complex operations to have higher CEO pay ratio, since these firms demand higher ability

<sup>2</sup> Total CEO compensation is obtained from the Execucomp database (TDC1) and median employee compensation is measured at each 2-digit SIC level. We convert industry median employee pay at each 3-digit NAICS level into its corresponding 2-digit SIC code level. Due to the availability of data source, we concede that our median employee compensation is measured at industry level instead of firm level.

CEOs. We use the logarithm of total assets (*AT*) as a proxy for firm size. We control for firms' growth opportunities by including market to book ratio (*MTB*) and capital expenditures (*CAP*). Market to book ratio is calculated as the ratio of the market value of equity to the book value of equity, and capital expenditures is the ratio of capital expenditures to total assets. We include variables *FIRMAGE*, *BUSSEG*, *GEOSSEG*, and *FOREIGN* to measure the complexity of the firm's operations. Firm age (*FIRMAGE*) is the logarithm of the current year minus the year in which the firm was first listed on CRSP. Segments are measured as the logarithm of the number of business segments (*BUSSEG*) and the logarithm of the number of geographic segments (*GEOSSEG*). Foreign currency translation (*FOREIGN*) is equal to one if the firm reports foreign currency translation gains or losses and zero otherwise. Finally, we control for the effect of capital structure on CEO pay ratio. Ortiz-Molina (2007) finds that capital structure affects the design of CEO compensation packages. We use *LEVERAGE*, the ratio of long-term debt to total assets, as a proxy for capital structure.

### 3.1.3. Variables for labor market

In the analysis of CEO pay ratio, we argue that the relative CEO compensation to median employee compensation is also influenced by the bargaining power of lower level employees relative to management. The bargaining power of lower level employees increases with employees' skills and outside opportunities. We use R&D expenditures, scaled by total assets (*RD*), and physical capital intensity (*PPT\_INTENSTY*), measured as net property, plant, and equipment per employee in millions of dollars, to proxy for employee skills. R&D expenditures have been identified as sources of innovation, and employees' skills are crucial for enhancing innovation (Toner, 2011). Faleye, Reis, and Venkateswaran (2013) suggest that firms with higher R&D investment need highly skilled employees to execute R&D projects. Physical capital intensity is used to capture the requirement of highly skilled employees for those capital-intensive firms relative to labor intensive firms. Following Faleye et al. (2013), we use industry concentration (*L\_CONCENTRATION*), industry homogeneity (*L\_HOMOGENEITY*), and employee unionization (*UNION*), to proxy for employee outside opportunities. Industry concentration is calculated as the sales-based Herfindahl index over all COMPUSTAT firms in the same two-digit SIC industry. A higher Herfindahl index indicates an industry dominated by fewer firms, thus reducing employee outside opportunities. Industry homogeneity is perceived to measure the similarity among firms in the same industry, computed as the partial correlation between the firm's return and an equally-weighted industry index for all firms in the same two-digit SIC industry, holding market return constant.<sup>3</sup> Industry homogeneity captures the ease with which employee skills transfer among firms in an industry. Employee unionization is measured as the percentage of unionized employees in the industry in each year.<sup>4</sup> We expect CEO pay ratio increases with industry concentration and decreases with R&D investment, physical capital intensity, industry homogeneity, and employee unionization.

## 3.2. Path analysis

### 3.2.1. Description of the path analysis model

Path analysis can be compared to and contrasted with traditional regression analysis along several dimensions. First, like regression analysis, path analysis is based on a linear statistical model. Second, unlike regression analysis that requires the researchers to specify a dependent

variable and a set of explanatory variables, path analysis requires researchers to identify source variables, mediating variables, and outcome variables (Baron & Kenny, 1986; Bebchuk et al., 2011). Consistent with past path analysis research, we derive the specification of the direct and indirect paths for our path analysis model from theory or from the reasoning based on past research about the relationships among variables. Third, path analysis is like regression analysis in revealing overall effects. However, path analysis is unlike regression analysis in providing evidence about the existence and relative importance of direct and indirect paths that jointly explain the overall effects. Finally, path analysis is a much more flexible methodology than regression analysis that allows multiple source variables, each with its own set of direct and indirect paths. For example, a path analysis diagram provides a convenient way to present complex relationships among the source, mediating, and outcome variables.

Following prior studies that use path analysis (Bhattacharya, Ecker, Olsson, & Schipper, 2012; Defond, Lim, & Zang, 2016; Pevzner, Xie, & Xin, 2015), we estimate the following model:

$$PERFORMANCE_t = \alpha_0 + \alpha_1 Pay\ Equity_{t-1} + \alpha_2 Pay\ Inequity_{t-1} + \alpha_3 SATISFACTION_t + \alpha_4 Controls + e_t \quad (2a)$$

$$SATISFACTION_t = \beta_0 + \beta_1 Pay\ Equity_{t-1} + \beta_2 Pay\ Inequity_{t-1} + e_t \quad (2b)$$

In model 2a, dependent variables (*PERFORMANCE*) are outcome variables. Pay Equity (*P\_RATIO*) and pay inequity (*R\_RATIO*) are measured using the predicted CEO pay ratio and the residual from model 1 respectively. *Controls* are relevant control variables for other factors affecting firm performance. We include controls for firm size (*SIZE*, measured as the log of total assets), growth opportunities (*MB*, measured as market-to-book ratio), prior year *PERFORMANCE*, as well as the firm's market-adjusted return (*A\_RET*) to capture the potential impact of stock return on firm performance. As indicated in Fig. 2, the path coefficient  $\alpha_1$  is the magnitude of the direct path from *Pay Equity* to firm performance, while the path coefficient  $\alpha_2$  is the magnitude of the direct path from *Pay Inequity* to firm performance. The path coefficient  $\beta_1$  ( $\beta_2$ ) in model 2b captures employees' perception of pay equity (inequity). The two indirect path coefficients that are the focus of our study are (1)  $\beta_1 * \alpha_3$ , which is the magnitude of the indirect path from *Pay Equity* to firm performance mediated through employee satisfaction and (2)  $\beta_2 * \alpha_3$ , which is the magnitude of the indirect path from *Pay Inequity* to firm performance mediated through employee satisfaction. Following Bebchuk et al. (2011), we use one-year lagged *Pay Equity* and *Pay Inequity* in our models to alleviate endogeneity concerns.

### 3.2.2. Measures for firm performance

Our proxies for firm performance (*PERFORMANCE*) include a market-based measure, adjusted Tobin's Q, and an accounting-based measure, adjusted return on assets. Tobin's Q is widely used in the literature as a measure of firm value (Bebchuk et al., 2011; Gompers, Ishii, & Metrick, 2003; Yermack, 1996). Tobin's Q is defined as the market value of equity plus the book value of assets minus the book value of equity, scaled by the book value of assets. Because of the importance of industry specific factors on firm performance, we follow Gompers et al. (2003) approach using industry adjusted Tobin's Q (*ADJ\_Q*), measured as a firm's Q minus the median Q in the two-digit standard industrial classification group in each observation year.

However, Tobin's Q has been criticized due to its ambiguous relationship with firm performance confounded by the endogeneity problem (Dybvig & Warachka, 2012). For example, inefficiency because of underinvestment lowers firm performance but increases Tobin's Q. Therefore, we use an accounting-based measure of operating performance. ROA is defined as net income before extraordinary items and discontinued operations divided by total assets. Like industry adjusted Tobin's Q, we use industry adjusted ROA (*ADJ\_ROA*), which is a firm's

<sup>3</sup> We first calculate an equally-weighted industry index by assigning firms' monthly returns to their respective 4-digit SIC industry code. Then we compute the partial correlation coefficient between the firm's stock returns and the industry index while holding market returns constant. Industry homogeneity is measured as the average partial correlation coefficient for all firms within an industry.

<sup>4</sup> This data is from the Current Population Surveys (CPSs) of the Bureau of Labor Statistics, which can be accessed at <http://www.unionstats.com/>. Due to data limitations, this variable is constructed at the industry level.

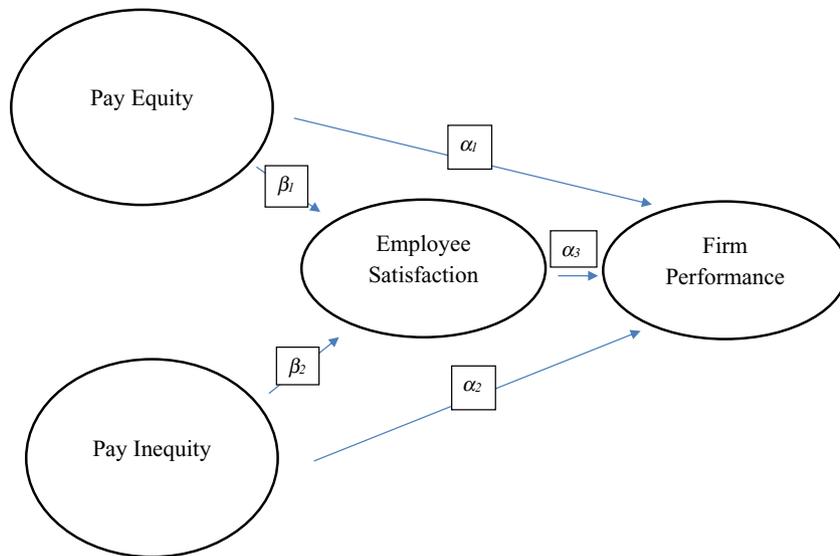


Fig. 2. Direct and indirect paths between CEO pay fairness and firm performance.

ROA minus the median ROA in the two-digit SIC industry for a given year using all firms in COMPUSTAT.

### 3.2.3. Measures for employee satisfaction

Consistent with past research (Edmans, 2011, 2012), we capture employee satisfaction with measures derived from the “Forbes Magazine 100 Best Companies to Work for in America” listings. Past surveys conducted by the *Great Place to Work Institute* (producing yearly listings of “Forbes Magazine 100 Best Companies to Work for in America”) indicate that lower-level employees are very aware of fairness in the workplace. They can differentiate when their companies’ cultures foster trust between lower-level employees and management and when they do not (Edmans, 2012).<sup>5</sup> One conclusion drawn from the yearly survey aimed at identifying the “Forbes Magazine 100 Best Companies to Work for in America” is that employees are constantly evaluating their work place environment. When they believe they are more fairly treated, they develop higher trust in the firms’ management, leading to higher satisfaction. Conversely, when employees believe that they are less fairly treated, they develop lower trust in the firms’ management, leading to lower satisfaction. The *Great Place to Work Institute* surveys indicate that employees have intimate knowledge of their work place environments. Past equity theory research and past research using “Forbes Magazine 100 Best Companies to Work for in America” listings indicate employees’ judgments of the fairness of their treatment may affect employee loyalty, morale and firm performance (Bamberger et al., 2014; Bobocel & Gosse, 2015; Cowherd & Levine, 1992; Parmar et al., 2010). In addition, Simon and DeVaro (2006) shows that the Best Companies on the list have high customer satisfaction.

As a measure of employee satisfaction, the Best Companies list has several advantages. First, it is the most well-known measure that receives substantial attention from shareholders, employees, and media (Edmans, 2012). This list consists of firms that are clearly identified by the trust they provide their employees. As a result, it gives us the power to investigate the effects of employees’ perception of pay fairness on firm performance. Second, the Best Companies list has been published since 1998. The outcome of employees’ rating is not driven by a specific time period (Edmans, 2012). However, the list has its own

<sup>5</sup> The survey methodology used by *Forbes* to identify the 100 best places to work each year is found at <https://www.greatplacetowork.com/certification>. This methodology is based on past findings that lower-level employees are aware how they are treated compared to other employees in the company and can identify whether the criteria used for distributing rewards are fair or not fair.

limitations. First, *Great Place to Work Institute* does not conduct a survey of all companies. In fact, this institute requires companies to be at least five years old and have more than 1000 U.S. employees to be eligible for survey participation. Second, it is not exclusively a measure of employee satisfaction. About one third of a firm survey score is from management responses to the Culture Audit.

We use two proxies for *SATISFACTION*. The first is a dummy variable *BEST*, equal to 1 if a firm is on the list of the “Forbes Magazine 100 Best Companies to work for in America” and 0 otherwise. The second is *RANKING*, the numerical employee satisfaction rating from the list of the “100 Best Companies to Work for in America.” This variable equals 1 if the firm is not listed; it equals 2 if the firm is ranked in the bottom three deciles; it equals 3 if the firm is ranked in the middle four deciles; it equals 4 if the firm is ranked in the top three deciles. Since *RANKING* takes the values from 1 to 4, a higher value indicates higher employee satisfaction.

## 4. Sample selection and descriptive statistics

### 4.1. Sample selection

Our initial sample includes firms with CEO compensation data from the Execucomp database. Following prior studies, we exclude firms that are in regulated industries [firms with standard industrial classification (SIC) codes between 6000 and 6999 and between 4900 and 4999]. Next, we delete firms less than five years old and with fewer than 1000 U.S. employees since the list of the “Forbes Magazine 100 Best Companies to Work for in America” (*Forbes 100 list*) imposes these additional requirements for firms to be eligible to participate in the survey. We then merge the data with COMPUSTAT, CRSP, and BoardEx to extract information on firm characteristics, stock returns, and CEO attributes. These screenings result in a final sample of 4890 firm-year observations covering the period from 2002 to 2011, representing 794 unique firms.<sup>6</sup>

### 4.2. Descriptive statistics

Table 1 presents summary statistics of variables. To mitigate the impact of outliers, all continuous variables are winsorized at the top and bottom 1% of their distributions. The mean and median CEO pay ratio

<sup>6</sup> We are limited to this time period because of data limitations related to merging our compensation, satisfaction and financial variables.

**Table 1**  
Descriptive statistics.

Variable	Mean	Std Dev	25th Pctl	Median	75th Pctl
<i>CEO pay ratio</i>					
RAW_PAYRATIO	146.19	193.29	43.03	89	176.48
PAYRATIO	4.39	0.93	3.97	4.32	5.31
IND_MEDIAN	4.26	0.44	4.06	4.18	4.75
<i>Pay equity</i>					
P_RATIO	4.38	0.59	3.95	4.20	4.99
<i>Pay inequity</i>					
R_RATIO	0.0034	0.65	-0.43	0.027	0.47
<i>Employee satisfaction</i>					
BEST	0.09		0	0	0
RANKING	1.14	0.49	1	1	1
<i>Firm performance</i>					
Q	1.77	0.95	1.15	1.48	2.04
ADJ_Q	0.24	0.97	-0.26	0	0.42
ROA	0.1	0.08	0.05	0.09	0.14
ADJ_ROA	0.02	0.04	-0.03	0.01	0.07
RETX	0.03	0.43	-0.14	0.07	0.26
<i>Other firm characteristics</i>					
STD_RETX	0.37	0.24	0.2	0.31	0.48
STD_ROA	0.03	0.04	0.01	0.02	0.04
CAP	0.04	0.04	0.02	0.03	0.06
LEVERAGE	0.56	0.22	0.4	0.55	0.69
AT	8.1	1.59	6.92	7.93	9.05
MTB	3.33	64.6	1.4	2.1	3.29
FIRMAGE	3.08	0.63	2.56	3.04	3.66
BUSSEG	0.88	0.74	0	1.1	1.61
GEOSEG	1	0.73	0.69	1.1	1.61
FOREIGN	0.33		0	0	1
<i>Employee skills and opportunities</i>					
RD	0.02	0.05	0	0	0.03
PPT_INTENSITY	0.17	0.06	0.03	0.04	0.09
UNION	0.11	0.08	0.04	0.11	0.16
I_CONCENTRATION	0.07	0.06	0.05	0.06	0.08
I_HOMOGENEITY	0.29	0.09	0.22	0.27	0.36
<i>Managerial entrenchment</i>					
EINDEX	2.98	1.35	2	3	4
CHAIR	0.62		0	1	1

All variables are defined in the Appendix.

(RAW\_PAYRATIO) are about 146 and 89 times the average employee's pay for our sample firms respectively.<sup>7</sup> To reduce the skewness, we use the natural logarithm of CEO pay ratio (PAYRATIO). The mean (median) PAYRATIO is 4.39 (4.32). Related to our measures of employee satisfaction, we find that about 9% of our sample firms are on the *Forbes* 100 list and the mean (median) ranking score is 1.14 (1). Turning next to firm performance, Table 1 shows that the mean (median) value of Tobin's Q (Q) and return on assets (ROA) is 1.77 (1.48) and 0.1 (0.09) respectively. We use industry adjusted Tobin's Q and industry adjusted ROA to control for the impact of industry factors on firm value. The mean (median) ADJ\_Q and ADJ\_ROA across the sample is 0.24 (0.00) and 0.02 (0.01) respectively. Next, we find that the mean (median) for entrenchment index (EINDEX) is 2.98 (3) and about 62% of the sample firms have dual CEO-chairman positions (CHAIR). Our results in Table 1 are consistent with the descriptive statistics in Adams and Ferreira (2009), Bebchuk et al. (2011), and Faleye et al. (2013).

Table 2 presents Pearson correlations of the variables of interest. As shown in Table 2, the correlation between PAYRATIO and P\_RATIO (R\_RATIO) is significantly positive at 0.68 (0.51) and the correlation between P\_RATIO and R\_RATIO is marginally negative at 0.15, consistent with prior research (Rouen, 2020). As we expected, P\_RATIO (R\_RATIO) is positively (negatively) correlated with BEST, RANKING,

ADJ\_ROA, and ADJ\_Q, confirming that the greater the pay equity (inequity), the better (poorer) the employee satisfaction and firm performance. In addition, we find R\_RATIO is significantly and positively correlated with EINDEX and CHAIR, indicating pay inequity increases with CEO entrenchment.<sup>8</sup> In short, the findings in Table 2 provide preliminary evidence to validate our estimate of P\_RATIO as a measure of pay equity and R\_RATIO as a measure of pay inequity.

Given that CEO pay ratio is highly correlated with CEO pay (correlation coefficient = 0.81 in unreported statistics), it is possible that excessive CEO pay negatively drives employee satisfaction, which in turn impacts firm performance. Next, we perform additional analysis to address this concern. The excessive CEO pay is estimated as the residual from a model that regresses CEO total annual compensation on proxies for firm size (AT), firm performance (ROA and RETX), firm risk (STD\_ROA and STD\_RETX), firm complexity (FIRMAGE, BUSSEGS, GEOSSEGS, and FOREIGN), growth opportunities (MTB and CAP), capital structure (LEVERAGE), and industry membership. To alleviate endogeneity concerns, we use one-year lagged excessive CEO pay. Consistent with our expectation, we find (in untabulated tests) that excessive CEO pay is negatively and significantly associated with firm performance. Interestingly, our unreported statistics show that the correlation between excessive CEO pay is not significantly associated with employee satisfaction (BEST and RANKING), suggesting that the indirect effect of excessive CEO pay on firm performance through employee satisfaction does not hold. These results reveal that the indirect path is not driven by excessive CEO pay and reinforce a point that CEO pay ratio reflects a shift in research emphasis from absolute CEO pay in isolation to relative CEO pay (Connelly et al., 2016).

## 5. Empirical results

### 5.1. Results on the determinants of CEO pay ratio

Table 3 presents the results of the determinants of PAYRATIO. The regression model in Table 3 has significant explanatory power (adjusted  $R^2 = 0.46$ ). Consistent with our expectation, we find CEO pay ratio (PAYRATIO) is positively related to industry median pay ratio (IND\_MEDIAN), return on assets (ROA), standard deviation of return on assets (STD\_ROA), standard deviation of stock returns (STD\_RETX), firm size (AT), and the logarithm of the number of geographic segments (GEOSEG) and negatively related to firm leverage (LEVERAGE). Among employee skills and outside opportunities variables, we find that CEO pay ratio positively correlates with R&D investment (RD) and industry concentration (I\_CONCENTRATION). The positive coefficient on R&D investment is surprising since it implies companies with high R&D investment tend to have high CEO pay ratio. As expected, the coefficients on physical capital intensity (PPT\_INTENSITY) and industry homogeneity (I\_HOMOGENEITY) are significantly negative. We use the predicted

<sup>7</sup> Our unreported statistics indicate that the average (median) total CEO compensation in the sample is \$5,536,023 (\$2,235,457). The average employee in a 2-digit SIC code industry receives \$41,969.

<sup>8</sup> To further check the validity of our estimate of pay equity (P\_RATIO), we perform a correlation analysis between P\_RATIO and a measure of managerial ability developed by Demerjian, Lev, and McVay (2012). If the CEOs are being rewarded with higher CEO pay ratios due to their talent, we expect a positive relationship between pay equity and managerial ability as the tenants of tournament theory state that the CEO pay ratio must be sufficient to effectively attract and retain the best CEO talent. Managerial ability data is available at <http://faculty.washington.edu/pdemerj/data.html> by Demerjian et al. (2012). Managerial ability is measured using Data Envelopment Analysis (DEA), an optimization program that evaluates managers' efficiency in transforming a given set of corporate resources (inventory, general and administrative expenses, fixed assets, operating leases, past research and development expenditures, and intangible assets) into revenues, relative to their industry peers. After regressing firm efficiency on firm size, market share, positive cash flow, firm age, and business segment concentration, the residuals reflect managerial ability – managerial contribution to firm efficiency (Demerjian et al., 2012). Consistent with our expectation, our untabulated statistics show that P\_RATIO is positively and significantly correlated with managerial ability, with a coefficient of 0.12. Interestingly, we find that R\_RATIO has a correlation of -0.09 with managerial ability, significant at the 1% level, suggesting that talented CEOs are less likely to receive a pay premium due to an unfair distribution of rents.

**Table 2**  
Pearson correlation of key variables.

	PAYRATIO	P_RATIO	R_RATIO	EINDEX	CHAIR	BEST	RANKING	ADJ_ROA	ADJ_Q
PAYRATIO	1	0.68 (<0.0001)	0.51 (<0.0001)	-0.04 (<0.0001)	0.17 (<0.0001)	0.14 (<0.0001)	0.12 (<0.0001)	0.15 (<0.0001)	0.09 (<0.0001)
P_RATIO		1	-0.15 (0.08)	-0.11 (<0.0001)	0.2 (<0.0001)	0.25 (<0.0001)	0.24 (<0.0001)	0.27 (<0.0001)	0.17 (<0.0001)
R_RATIO			1	0.04 (<0.0001)	0.05 (0.01)	-0.07 (0.02)	-0.06 (<0.0001)	-0.07 (<0.0001)	-0.06 (<0.0001)
EINDEX				1	0.02 (0.08)	-0.08 (<0.0001)	-0.08 (<0.0001)	-0.03 (0.04)	-0.09 (<0.0001)
CHAIR					1	0.03 (0.03)	0.24 (0.11)	0.02 (0.25)	-0.04 (0.01)
BEST						1	0.92 (<0.0001)	0.1 (<0.0001)	0.15 (<0.0001)
RANKING							1	0.09 (<0.0001)	0.15 (<0.0001)
ADJ_ROA								1	0.59 (<0.0001)
ADJ_Q									1

CEO pay ratio that is explained by these economic variables to capture pay equity and the residual to capture pay inequity.

### 5.2. Hypothesis tests: Results on direct and indirect paths between pay fairness and firm performance

In Table 4, we present the results of our direct and indirect path analysis tests between pay fairness and firm performance. Turning first to pay equity ( $P\_RATIO$ ), we find that the Pearson correlation between  $P\_RATIO$  and  $PERFORMANCE$  in model 1 and model 2 using performance measure  $ADJ\_ROA$  are both positive and equal to 0.2749; the Pearson correlation in model 3 and model 4 using  $ADJ\_Q$  are both positive and equal to 0.1728. These results imply that pay equity, measured by a larger CEO pay ratio due to economic factors, is associated with better firm performance. To confirm the consistency of our empirical results with past research we start with the results of the direct path between  $P\_RATIO$  and the outcome variable, measured as  $ADJ\_ROA$  and  $ADJ\_Q$ . The positive relationship between pay equity and firm performance

**Table 3**  
Determinants of CEO pay ratio.

Variable	PAYRATIO	
	Parameter	Standard
	Estimate	Error
Intercept	-1.17 ***	0.13
IND_MEDIAN	0.57***	0.02
RETX	-0.01	0.03
ROA	2.16***	0.12
STD_RETX	0.12**	0.05
STD_ROA	1.47***	0.31
MTB	0.00	0.00
AT	0.37***	0.01
CAP	0.33	0.25
FIRMAGE	0.02	0.02
BUSSEG	0.02	0.02
GEOSG	0.06***	0.01
FOREIGN	0.02	0.03
LEVERAGE	-0.05**	0.02
RD	0.61**	0.27
PPT_INTENSITY	-0.08***	0.02
UNION	0.09	0.13
I_CONCENTRATION	0.45***	0.17
I_HOMOGENEITY	-0.72***	0.10
Year dummies	YES	
Number of observations	4890	
Adjusted R <sup>2</sup>	0.46	

\*, \*\*, \*\*\* indicate significance at the 10%, 5%, and 1% level, respectively, according to a two-tailed test. All variables are defined in the Appendix.

shown by the direct path coefficient  $p(P\_RATIO, PERFORMANCE)$  confirms an important past finding in the management literature related to equity theory and supports the optimal contracting theory in the finance literature. Next, we discuss our indirect or mediated path empirical results, which form the basis for our conclusions about hypothesis 1. This hypothesis is stated in its alternative form as follows: *Employee satisfaction positively mediates the path between pay equity and firm performance*. Since our indirect or mediated path is mediated by  $SATISFACTION$ , we compute the total mediated path coefficient as the product of mediated path coefficients  $p(P\_RATIO, SATISFACTION)$  and  $p(SATISFACTION, PERFORMANCE)$ . We have two measures of  $SATISFACTION$ . The first is a dummy variable  $BEST$ , equal to 1 if a firm is on the list of the "Forbes Magazine 100 Best Companies to work for in America" and 0 otherwise. The second measure of  $SATISFACTION$  is  $RANKING$  that takes the values from 1 to 4 with a higher number indicating higher employee satisfaction. A positive correlation coefficient relating  $P\_RATIO$  to  $SATISFACTION$  implies higher satisfaction for the  $SATISFACTION$  variables measured as  $BEST$  and  $RANKING$ . Consistent with our expectation that employees seem to be able to perceive pay fairness, we find positive coefficients,  $p(P\_RATIO, BEST)$  in models 1 and 3 and  $p(P\_RATIO, RANKING)$  in models 2 and 4. The coefficients in path analysis are standardized, allowing inferences to be drawn on the relative strength of relationships. Our total mediated path for  $SATISFACTION$ , measured as  $BEST$  provides an example of the economic significance of our results. The total mediated path is significantly positive, with a coefficient of 0.0129 in model 1 (0.0176 in model 3). The coefficient implies that a one-standard-deviation increase in predicted CEO pay ratio from economic factors results in 0.0129-standard-deviation (0.0176-standard-deviation) increase in adjusted ROA (adjusted Q) through  $P\_RATIO$ 's impact on employee satisfaction measured as  $BEST$ .

Following [Bhattacharya et al. \(2012\)](#), we measure the importance of direct and indirect (mediated) path as the ratio of that path coefficient to the total correlation between pay equity and firm performance. These results show that the direct and mediated paths are significantly nonzero, and the direct link (75.59% in model 1, 75.26% in model 2, 68.46% in model 3, and 69.21% in model 4) is substantially more important than the indirect link (4.72% in model 1, 5.04% in model 2, 10.19% in model 3, and 9.46% in model 4). In summary, our results are consistent with equity theory and support the Optimal Contracting Theory that is prevalent in the finance literature for explaining CEO pay ratio ([Core et al., 1999](#)). In addition, we contribute to the CEO pay ratio literature by showing that our mediated path evidence is consistent with the conclusion that fair CEO pay ratios promote employee satisfaction, and firms with more satisfied employees perform better ([Edmans, 2011, 2012](#)). In this case we find that as the CEO pay ratio driven by economic factors becomes larger, the positive effect on employee satisfaction is

**Table 4**  
Direct and mediated effects of pay fairness on firm performance.

	Model 1 <i>ADJ_ROA/BEST</i>	Model 2 <i>ADJ_ROA/RANKING</i>	Model 3 <i>ADJ_Q/BEST</i>	Model 4 <i>ADJ_Q/RANKING</i>
<i>r</i> ( <i>P_RATIO, PERFORMANCE</i> )	0.2749 (0.00)	0.2749 (0.00)	0.1728 (0.00)	0.1728 (0.00)
<i>Direct path</i>				
<i>p</i> ( <i>P_RATIO, PERFORMANCE</i> )	0.2078 (0.00)	0.2069 (0.00)	0.1183 (0.00)	0.1196 (0.00)
Percentage	75.59%	75.26%	68.46%	69.21%
<i>Mediated path</i>				
<i>p</i> ( <i>P_RATIO, SATISFACTION</i> )	0.2334 (0.00)	0.2355 (0.00)	0.2328 (0.00)	0.2379 (0.00)
<i>p</i> ( <i>SATISFACTION, PERFORMANCE</i> )	0.0556 (0.00)	0.0589 (0.00)	0.0757 (0.00)	0.0687 (0.00)
Total mediated path	0.0129 (0.00)	0.0138 (0.00)	0.0176 (0.00)	0.0163 (0.00)
Percentage	4.72%	5.04%	10.19%	9.46%
<i>r</i> ( <i>R_RATIO, PERFORMANCE</i> )	-0.0705 (0.02)	-0.0705 (0.02)	-0.0594 (0.06)	-0.0594 (0.06)
<i>Direct path</i>				
<i>p</i> ( <i>R_RATIO, PERFORMANCE</i> )	-0.0498 (0.02)	-0.0502 (0.02)	-0.0405 (0.05)	-0.0408 (0.05)
Percentage	70.64%	71.21%	68.18%	68.69%
<i>Mediated path</i>				
<i>p</i> ( <i>R_RATIO, SATISFACTION</i> )	-0.0814 (0.06)	-0.0701 (0.06)	-0.0645 (0.08)	-0.0667 (0.08)
<i>p</i> ( <i>SATISFACTION, PERFORMANCE</i> )	0.0556 (0.00)	0.0589 (0.00)	0.0757 (0.00)	0.0687 (0.00)
Total mediated path	-0.0045 (0.06)	-0.0041 (0.06)	-0.0049 (0.08)	-0.0046 (0.08)
Percentage	6.42%	5.86%	8.22%	7.71%
Controls	YES	YES	YES	YES
N	4890	4890	4890	4890

*p*-values are reported in parentheses. All variables are defined in the Appendix.

associated with greater increase in firm performance than is explained by the direct path between pay equity and firm performance alone.

In Table 4, we also present the results of our direct and indirect path analysis tests related to pay inequity. To confirm the consistency of our empirical results with past research, we start with the results of the direct path between *R\_RATIO* and *PERFORMANCE*, measured as *ADJ\_ROA* and *ADJ\_Q*. We find the correlation between *R\_RATIO* and *PERFORMANCE* in model 1 and model 2 using performance measure *ADJ\_ROA* is -0.0705; the correlation in model 3 and model 4 using *ADJ\_Q* is -0.0594. These results imply that firms with CEOs that are rewarded with unfairly large pay ratios perform worse. The relationship between pay inequity and firm performance shown by the direct path coefficient *p*(*R\_RATIO, PERFORMANCE*) confirms important findings in the finance and management literatures related to the negative consequences of managerial rent-seeking behavior.<sup>9</sup>

Next, we discuss our indirect or mediated path empirical results in Table 4, which form the basis for our conclusions about hypothesis 2. This hypothesis is stated in its alternative form as follows: *Employee satisfaction negatively mediates the path between pay inequity and firm performance*. Since our indirect path is mediated by *SATISFACTION*, we compute the total mediated path coefficient as the product of mediated path coefficients (e.g., *p* (*R\_RATIO, SATISFACTION*)) and employee satisfaction and firm performance (e.g., *p* (*SATISFACTION, PERFORMANCE*)). Similar to our analysis of pay equity, we use these two path coefficients to calculate the total mediated path coefficient for the indirect path between pay inequity and firm performance that is mediated by employee satisfaction. The total mediated path coefficient for the indirect path is

computed as the product of the path coefficient *p* (*R\_RATIO, SATISFACTION*) and *p* (*SATISFACTION, PERFORMANCE*). Consistent with our expectation that employees view CEO pay ratio driven by non-economic factors unfavorably, our findings suggest that as the CEO pay ratio related to non-economic factors becomes larger, the negative effect on employee satisfaction is associated with a greater decrease in firm performance. This contrasts with the higher employee satisfaction when they perceive the CEO pay ratio to be fair. In summary, our direct path results and mediated path results for pay inequity are consistent with equity theory, relative deprivation theory, and managerial rent-seeking literature in management and accounting (Bivens & Mishel, 2013; Piketty, 2014). In addition, we contribute to the CEO pay ratio literature by showing that our mediated path evidence is consistent with the conclusion that pay inequity violates the fairness norm. In this environment, employees respond negatively and firms with more dissatisfied employees perform worse (Edmans, 2011, 2012).

### 5.3. Results on direct and indirect paths between pay fairness and firm performance in the context of managerial entrenchment

In this section, we probe the relation between pay fairness and firm performance in the context of managerial entrenchment. We target managerial entrenchment because it is a root cause of a disproportionate allocation of rents to CEOs. Managerial entrenchment as defined by Berger, Ofek, and Yermack (1997) is "the extent to which managers fail to experience discipline from the full range of corporate governance and control mechanisms, including monitoring by the board, the threat of dismissal or takeover..." The agency conflict between the CEO (agent) and shareholder (principal) is exacerbated when managers are entrenched. We use a composite measure of managerial entrenchment including Bebchuk et al.'s (2009) entrenchment index (*EINDEX*) and an

<sup>9</sup> This finding confirms the views by Piketty (2014) in his book *Capital in the Twenty-First Century* and the views by Bedchuk and Fried (2004) in their book, *Pay without performance: The unfulfilled promise of executive compensation*.

indicator variable capturing whether the CEO is also the firm's board chairman (*CHAIR*). *EINDEX* has been used to capture the governance arrangements that protect incumbents from removal (Bebchuk et al., 2009). CEO duality (*CHAIR*) may provide the CEO with additional power to engage in entrenchment behavior. We argue that a company in the sample has high (low) managerial entrenchment if *EINDEX* is higher (lower) than the value of the sample's median and *CHAIR* equals to 1 (0). We separately perform the direct and indirect path analysis for companies with high managerial entrenchment and for companies with low managerial entrenchment. In the analysis of managerial entrenchment, we further merge data with Institutional Shareholder Service (ISS)' Governance database. This screening leaves 4572 firm-year observations.

In Table 5 Panel A, we report the results of path analysis for the subsample with high managerial entrenchment. We find that the direct and indirect paths between pay equity/pay inequity and firm performance remain statistically non-zero (at the 0.05 level). The importance of the indirect link between *R\_RATIO* (mediated by employee satisfaction) and firm performance for firms with high managerial entrenchment is higher than that in the whole sample. It ranges from 10.20% to 13.73% in Table 5 Panel A versus 5.86% to 8.22% in Table 4. In contrast, the importance of the indirect link between *P\_RATIO* and firm performance, mediated by employee satisfaction, does not exhibit a similar pattern. Specifically, the mediated path explains about 4.80% to 10.51% of the correlation between pay equity and firm performance in Table 5 Panel A, compared to 4.72% to 10.19% in Table 4.

Next, we perform path analysis for the subsample with low managerial entrenchment. Table 5 Panel B shows the results. The direct effect of pay inequity on firm performance remains significantly negative. However, the statistical significance of the indirect path is weak, with *p* values ranging from 0.21 to 0.36. We also compare the total mediated path coefficients, the product of the path coefficient *p(R\_RATIO, SATISFACTION)* and *p(SATISFACTION, PERFORMANCE)* among firms with high managerial entrenchment to firms with low managerial entrenchment. We find the mediated path is  $-0.0032$  ( $p = .21$ ) in model 1 Panel B for low entrenchment versus  $-0.0082$  ( $p = .01$ ) in model 1 Panel A for high entrenchment. These results imply the mediated path is 2.56 bigger when managerial entrenchment is high versus when it is low. Unreported *t*-test of the difference of the mediated path coefficient between high and low managerial entrenchment shows that the difference is statistically significant at  $p < .02$  or better. Results of *t*-tests of differences are similar for other measures of firm performance and employee satisfaction (models 2, 3, and 4). In sum, our results show that the correlation between pay inequity and firm performance attributable to the indirect link is more pronounced in firms with high managerial entrenchment than in firms with low managerial entrenchment. Such findings are consistent with our expectation that managerial entrenchment plays an important role not only in expanding the CEO pay ratio but also in amplifying the negative effects on performance through employees' perception of pay inequity. Overall, the results in Table 5 show that the indirect effect of pay inequity on firm performance through employee satisfaction depends on the level of managerial entrenchment.<sup>10</sup>

<sup>10</sup> Prior research documents that weak board monitoring fails to restrain CEO excessive pay. To further investigate the indirect effect of pay inequity on firm performance through employee satisfaction, we use board independence as a proxy for board effectiveness and separately perform path analysis for the subsample with a low proportion of independent directors and for the subsample with a high proportion of independent directors. A company has a high (low) proportion of independent directors, if the company's percentage of independent directors is higher (lower) than the median value. Independent directors play an important governance role in monitoring and disciplinary functions. If pay inequity reflects an unfair rent distribution due to poor board monitoring, we expect the negative indirect effects would be amplified in the subset of firms with low proportion of independent directors. Interestingly, our unreported statistics do not support this prediction. In fact, unreported *t*-test of difference on mediated path coefficient between high and low proportion of independent directors is insignificant. These findings may be not surprising, because a majority of the board of directors are required to be independent.

#### 5.4. Results on direct and indirect paths between pay fairness and firm performance in high-tech firms

One limitation of our analysis so far is that we are grouping together industries where the typical employee may not identify closely with the CEO in terms of education and training with industries where the CEO and typical employees are similarly trained and educated. Evidence supporting our equity theory-derived hypotheses should be stronger when the typical employees are from industries where they are similar to the CEO in terms of education and training.

The scenario is that their views of fairness are more affected by CEO pay ratio comparisons when they share these characteristics with their firms' CEOs. In some industries such as high-tech, we posit that the typical employee is not only well-compensated but also potentially as well educated as the CEO. Therefore, employees are more motivated to critically evaluate the reasonableness of CEO pay ratio and thus, the impact of pay fairness is more important for high-tech firms. We believe that high-tech industries, identified with high research and development expenditures, fit this pattern.

Our investigation of high-tech firms is also a response to inconsistent findings documented by extant research in economics and management (Ferraro et al., 2005; Levine, 1991; Shaw et al., 2002; Trevor et al., 2012) regarding the impact of pay dispersion on firm performance in interdependent work settings. Interdependent work requires substantial employee interaction and cooperation. Siegel and Hambrick (2005) and Shaw et al. (2002) find that the harmful effects of vertical pay dispersions are more pronounced in an interdependent work context. In contrast, Trevor et al. (2012) differentiates between horizontal pay dispersion that is tied to employee inputs and horizontal pay dispersion that is not. This research finds that in an interdependent work setting, the former is positively related to team performance while the latter is not related or is negatively related to team performance.

Our study aims to provide evidence using high-tech industries that fit a setting where tasks required for firm success are highly interdependent. Following OECD's (The Organization for Economic Co-operation and Development) classification criteria, we define high-tech industries as those that spent 4% or more of sales on R&D expenditures. This screening process results in 772 observations in those high-tech industries. We then perform path analysis on this subsample.

Table 6 shows the effects of pay fairness on firm performance for high-tech firms. All paths are statistically significant. The indirect path explains between 7.78% and 13.30% of the total effect of pay equity and firm performance in Table 6, which is higher than the 4.72% to 10.19% we find in Table 4. The importance of the indirect link between pay inequity (mediated by employee satisfaction) and firm performance exhibits a similar pattern. We find 12.46% in model 1, 12.08% in model 2, 15.20% in model 3, and 14.57% in model 4 in Table 6 versus 6.42% in model 1, 5.86% in model 2, 8.22% in model 3, and 7.71% in model 4 in Table 4. The coefficients on the mediated path are  $-0.010$  in model 1,  $-0.0097$  in model 2,  $-0.0097$  in model 3, and  $-0.0093$  in model 4 for high-tech firms in TABLE 6 compared to  $-0.0045$  in model 1,  $-0.0041$  in model 2,  $-0.0049$  in model 3, and  $-0.0046$  in model 4 for the entire sample in TABLE 4. Unreported *t*-tests of differences reveals that the difference in mediated path coefficients between high-tech firms and the entire sample is statistically significant across all models. In summary, the Table 6 results provide evidence suggesting that the correlation between pay equity/pay inequity and firm performance attributable to the indirect link, mediated by employee satisfaction, is more important in high-tech firms. These results extend Siegel and Hambrick (2005) by providing evidence why there may be detrimental effects associated with the size of pay ratios in high-tech firms. Our research also extends past research findings explaining why high-tech firms with larger pay ratios driven by economic factors may have more satisfied employees and, therefore, perform better. In this sense, our findings support Trevor et al.'s (2012) conclusion that a sorting perspective linking pay ratios to employee inputs can facilitate group

**Table 5**  
Direct and mediated effects of pay fairness on firm performance in the context of managerial entrenchment.

	Model 1 ADJ_ROA/BEST	Model 2 ADJ_ROA/RANKING	Model 3 ADJ_Q/BEST	Model 4 ADJ_Q/RANKING
<i>Panel A: Path analysis for firms with high managerial entrenchment</i>				
<i>r</i> (P_RATIO, PERFORMANCE)	0.2581 (0.00)	0.2581 (0.00)	0.1596 (0.00)	0.1596 (0.00)
<i>Direct path</i>				
<i>p</i> (P_RATIO, PERFORMANCE)	0.1947 (0.00)	0.1942 (0.00)	0.1092 (0.00)	0.1106 (0.00)
Percentage	75.44%	75.24%	68.42%	69.30%
<i>Mediated path</i>				
<i>p</i> (P_RATIO, SATISFACTION)	0.2261 (0.00)	0.2248 (0.00)	0.2264 (0.00)	0.2277 (0.00)
<i>p</i> (SATISFACTION, PERFORMANCE)	0.0548 (0.00)	0.0575 (0.00)	0.0741 (0.00)	0.0675 (0.00)
Total mediated path	0.0124 (0.00)	0.0129 (0.00)	0.0168 (0.00)	0.0154 (0.00)
Percentage	4.80%	5.01%	10.51%	9.63%
<i>r</i> (R_RATIO, PERFORMANCE)	-0.0774 (0.01)	-0.0774 (0.01)	-0.0621 (0.02)	-0.0621 (0.02)
<i>Direct path</i>				
<i>p</i> (R_RATIO, PERFORMANCE)	-0.0529 (0.01)	-0.0532 (0.01)	-0.0409 (0.02)	-0.0413 (0.02)
Percentage	68.35%	68.73%	65.86%	66.51%
<i>Mediated path</i>				
<i>p</i> (R_RATIO, SATISFACTION)	-0.1495 (0.01)	-0.1373 (0.01)	-0.1151 (0.02)	-0.1204 (0.02)
<i>p</i> (SATISFACTION, PERFORMANCE)	0.0548 (0.00)	0.0575 (0.00)	0.0741 (0.00)	0.0675 (0.00)
Total mediated path	-0.0082 (0.01)	-0.0079 (0.01)	-0.0085 (0.03)	-0.0081 (0.03)
Percentage	10.58%	10.20%	13.73%	13.09%
Controls	YES	YES	YES	YES
N	1052	1052	1052	1052
<i>Panel B: Path analysis for firms with low managerial entrenchment</i>				
<i>r</i> (P_RATIO, PERFORMANCE)	0.2894 (0.00)	0.2894 (0.00)	0.1952 (0.00)	0.1952 (0.00)
<i>Direct path</i>				
<i>p</i> (P_RATIO, PERFORMANCE)	0.2202 (0.00)	0.2191 (0.00)	0.1349 (0.00)	0.1355 (0.00)
Percentage	76.09%	75.71%	69.11%	69.42%
<i>Mediated path</i>				
<i>p</i> (P_RATIO, SATISFACTION)	0.2418 (0.00)	0.2471 (0.00)	0.2439 (0.00)	0.2485 (0.00)
<i>p</i> (SATISFACTION, PERFORMANCE)	0.0572 (0.00)	0.0604 (0.00)	0.0768 (0.00)	0.0729 (0.00)
Total mediated path	0.0138 (0.00)	0.0149 (0.00)	0.0187 (0.00)	0.0181 (0.00)
Percentage	4.78%	5.16%	9.60%	9.28%
<i>r</i> (R_RATIO, PERFORMANCE)	-0.0686 (0.05)	-0.0686 (0.05)	-0.0585 (0.08)	-0.0585 (0.08)
<i>Direct path</i>				
<i>p</i> (R_RATIO, PERFORMANCE)	-0.0482 (0.04)	-0.0478 (0.04)	-0.0404 (0.06)	-0.0405 (0.06)
Percentage	70.26%	69.68%	69.06%	69.23%
<i>Mediated path</i>				
<i>p</i> (R_RATIO, SATISFACTION)	-0.0556 (0.24)	-0.0592 (0.38)	-0.0426 (0.35)	-0.0435 (0.42)
<i>p</i> (SATISFACTION, PERFORMANCE)	0.0572 (0.00)	0.0604 (0.00)	0.0768 (0.00)	0.0729 (0.00)
Total mediated path	-0.0032 (0.21)	-0.0036 (0.26)	-0.0033 (0.33)	-0.0032 (0.36)
Percentage	4.64%	5.21%	5.59%	5.42%
Controls	YES	YES	YES	YES
N	862	862	862	862

p-values are reported in parentheses. All variables are defined in the Appendix.

**Table 6**  
Direct and mediated effects of pay fairness on firm performance in high-tech industry.

	Model 1	Model 2	Model 3	Model 4
	ADJ_ROA/BEST	ADJ_ROA/RANKING	ADJ_Q/BEST	ADJ_Q/RANKING
<i>r</i> (P_RATIO, PERFORMANCE)	0.2902 (0.00)	0.2902 (0.00)	0.1965 (0.00)	0.1965 (0.00)
<i>Direct path</i>				
<i>p</i> (P_RATIO, PERFORMANCE)	0.2188 (0.00)	0.2179 (0.00)	0.1352 (0.00)	0.1358 (0.00)
Percentage	75.40%	75.09%	68.80%	69.11%
<i>Mediated path</i>				
<i>p</i> (P_RATIO, SATISFACTION)	0.2983 (0.00)	0.2929 (0.00)	0.2991 (0.00)	0.2964 (0.00)
<i>p</i> (SATISFACTION, PERFORMANCE)	0.0757 (0.00)	0.0802 (0.00)	0.0874 (0.00)	0.0862 (0.00)
Total mediated path	0.0226 (0.00)	0.0235 (0.00)	0.0261 (0.00)	0.0255 (0.00)
Percentage	7.78%	8.09%	13.30%	13.00%
<i>r</i> (R_RATIO, PERFORMANCE)	-0.0804 (0.00)	-0.0804 (0.00)	-0.0636 (0.00)	-0.0636 (0.00)
<i>Direct path</i>				
<i>p</i> (R_RATIO, PERFORMANCE)	-0.0558 (0.01)	-0.0561 (0.01)	-0.0419 (0.01)	-0.0423 (0.01)
Percentage	69.40%	69.78%	65.88%	66.51%
<i>Mediated path</i>				
<i>p</i> (R_RATIO, SATISFACTION)	-0.1323 (0.01)	-0.1211 (0.01)	-0.1106 (0.01)	-0.1075 (0.01)
<i>p</i> (SATISFACTION, PERFORMANCE)	0.0757 (0.00)	0.0802 (0.00)	0.0874 (0.00)	0.0862 (0.00)
Total mediated path	-0.010 (0.02)	-0.0097 (0.02)	-0.0097 (0.02)	-0.0093 (0.02)
Percentage	12.46%	12.08%	15.20%	14.57%
Controls	YES	YES	YES	YES
N	772	772	772	772

p-values are reported in parentheses. All variables are defined in the Appendix.

performance even in highly interdependent work settings. Our findings suggest that sophisticated, well-educated employees in high-tech firms have the ability to interpret CEO pay ratios as reflections of differential inputs in terms of productivity and human capital between CEOs and employees.

## 6. Conclusions

During the debate associated with the Dodd-Frank Act requirement that firms disclose CEO pay ratios, one group of SEC Commissioners claimed disclosure is only aimed at shaming CEOs with high ratios while another group argued the information is useful to investors. The goal our study is to contribute to the debate by investigating whether the size of a firm's CEO pay ratio has economic consequences for firm performance through its effect on employee satisfaction. For a large sample of Execucomp firms during 2002–2011, we examine the paths that link predicted CEO pay ratio arising from economic factors (pay equity) and non-economic factors (pay inequity) to firm performance. Using path analysis, we test for the existence and relative importance of these paths using two measures of employee satisfaction and two measures of firm performance. We confirm the direct paths found in past research between firm performance and pay fairness. Our indirect path analysis shows that employee satisfaction positively (negatively) mediates the relationship between pay equity (inequity) and firm performance. We also find that the negative indirect effect of pay inequity on firm performance through employee satisfaction is dependent on the degree of managerial entrenchment and membership in high tech industries.

Our results contribute to the Dodd-Frank debate about the usefulness to investors of CEO pay ratio information. Our findings suggest

that metrics derived from the CEO pay ratio are related to factors employees use to judge how fairly they are treated financially by their firms. Consistent with equity theory and past research from tournament theory and distributive justice literatures, we find employee satisfaction is a channel through which pay fairness affects firm performance. Our findings suggest that CEO pay ratio information may be important to investors because it may provide insight into economic consequences to the firm related to employee satisfaction.

## Acknowledgement

We thank the editor, Dr. Dennis Caplan, two anonymous reviewers, Janet Near, Jake Messersmith, Paul Tanyi, and John O'Brien for their constructive comments and suggestions. We also thank conference participants at the Southwestern American Accounting Association 2016 Meeting in Oklahoma City for their comments.

## Author declaration

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no

impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

We understand that the Corresponding Author is the sole contact for the Editorial process (including Editorial Manager and direct communications with the office). He/she is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs. We confirm that we have provided a current, correct email address which is accessible by the Corresponding Author and which has been configured to accept email from (Dr. David Smith, email address: [dsmith19@unl.edu](mailto:dsmith19@unl.edu)).

## Appendix A. Definition of variables

<i>CEO pay ratio</i>	
<i>Raw_PAYRATIO:</i>	CEO compensation divided by average employee pay in a 2-digit SIC code industry;
<i>PAYRATIO:</i>	The logarithm of CEO compensation divided by average employee pay in a 2-digit SIC code industry;
<i>P_RATIO:</i>	Predicted CEO pay ratio arising from economic factors in model 1;
<i>R_RATIO:</i>	Predicted CEO pay ratio arising from non-economic factors in model 1;
<i>IND_MEDIAN:</i>	The median CEO pay ratio in the two-digit industrial classification group;
<i>Employee satisfaction</i>	
<i>BEST:</i>	A dummy variable, equal to 1 if a firm is on the list of the "100 Best Companies to work for in America" and 0 otherwise;
<i>RANKING:</i>	Equals to 1 if firm is not listed on the "100 Best Companies to work for in America", equals to 2 if firm is ranked in the bottom three deciles of the "100 Best Companies to work for the America"; equals to 3 if firm is ranked in the middle four deciles of the "100 Best Companies to work for in America"; and equals to 4 if the firm is ranked in the top three deciles of the "100 Best Companies to work for in America";
<i>Firm performance</i>	
<i>Q:</i>	The market value of equity plus the book value of assets minus the book value of equity, divided by the book value of assets;
<i>ADJ_Q:</i>	Industry adjusted Tobin's Q, measured as a firm's Q minus the median Q in the two-digit standard industrial classification group in each observation year;
<i>ROA:</i>	Net income before extraordinary items and discontinued operations divided by total assets;
<i>ADJ_ROA:</i>	Industry adjusted ROA, measured as a firm's ROA minus the median ROA in the two-digit SIC industry for a given year using all firms in COMPUSTAT;
<i>RETX:</i>	Raw buy and hold stock returns for the year;
<i>A_RETX:</i>	Buy and hold stock returns for the year adjusted by CRSP value weighted index;
<i>Firm characteristics:</i>	
<i>STD_RETX:</i>	Standard deviation of annual stock returns for the prior five years;
<i>STD_ROA:</i>	Standard deviation of annual return on assets for the prior five years;
<i>CAP:</i>	Total capital expenditures scaled by total assets;
<i>LEVERAGE:</i>	Total long-term debt scaled by total assets;
<i>AT:</i>	The logarithm of total assets;
<i>MTB:</i>	Market value scaled by book value of the company;
<i>FIRMAGE:</i>	The logarithm of firm age;
<i>BUSSEG:</i>	The logarithm of the number of business segments;
<i>GEOSEG:</i>	The logarithm of the number of geographic segments;
<i>FOREIGN:</i>	A dummy variable, equal to 1 if the firm reports foreign currency translation gains or losses and 0 otherwise;
<i>Labor market variables</i>	
<i>RD:</i>	Research and development expense scaled by total assets;
<i>PPT_INTENSITY:</i>	Net property, plant, and equipment per employee in millions of dollars;
<i>UNION:</i>	The percentage of unionized workers in the industry in each year;

*I\_CONCENTRATION:* The sales-based Herfindahl index calculated based on all COMPUSTAT firms in the same industry;

*I\_HOMOGENEITY:* The mean partial correlation between firms' returns and equally weighted industry index, holding market return constant;

### *Managerial entrenchment:*

*EINDEX:* The six-factor entrenchment index following Bebchuk et al. (2004);

*CHAIR:* a dummy variable, equal to 1 if CEO is also the chair of the board and 0 otherwise;

## References

- Adams, R., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics*, 94(2), 291–309.
- AFL-CIO (2013). Securities and Exchange Commission (SEC) Release No. 33–9452. <http://www.aflcio.org/Corporate-Watch/Paywatch-2016>. <https://www.sec.gov/rules/proposed/2013/33-9452.pdf>.
- Akerlof, G. A., & Yellen, J. L. (1988). Fairness and unemployment. *The American Economic Review*, 78(2), 44–49.
- Bamberger, P. A., Biron, M., & Meshoulam, I. (2014). *Human Resource Strategy: Formulation, Implementation, and Impact* (2nd ed.). New York: NY, Routledge.
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173–1182.
- Bebchuk, L., Cohen, A., & Ferrell, A. (2009). What matters in corporate governance? *Review of Financial Economics*, 22, 783–827.
- Bebchuk, L. A., Cremers, K. J., & Peyer, U. C. (2011). The CEO pay slice. *Journal of Financial Economics*, 102(1), 199–221.
- Bebchuk, L. A., & Fried, J. M. (2004). *Pay Without Performance*. Cambridge, MA: Harvard University Press.
- Becker, B. E., & Huselid, M. A. (1992). The incentive effects of tournament compensation systems. *Administrative Science Quarterly*, 37, 336–350.
- Berger, P. G., Ofek, E., & Yermack, D. L. (1997). Managerial entrenchment and capital structure decisions. *The Journal of Finance*, 52(4), 1411–1438.
- Bhattacharya, N., Ecker, F., Olsson, P. M., & Schipper, K. (2012). Direct and mediated associations among earnings quality, information asymmetry, and the cost of equity. *The Accounting Review*, 87(2), 449–482.
- Bivens, J., & Mishel, L. (2013). The pay of corporate executives and financial professionals as evidence of rents in top 1 percent incomes. *Economic Policy Institute Working Paper*. <http://www.epi.org/publication/pay-corporate-executivesfinancial-professionals/>.
- Bloom, M., & Michel, J. (2002). The relationships among organizational context, pay dispersion, and among managerial turnover. *Academy of Management Journal*, 45(1), 33–42.
- Bobocel, D. R., & Gosse, L. (2015). Procedural justice: A historical review and critical analysis. In R. Cropanzano, & M. Ambrose (Eds.), *Oxford Handbook of Psychology Justice in Work Organizations* (pp. 51–87). New York: Oxford University Press.
- Cappelli, P., & Cascio, W. F. (1991). Why some jobs command wage premiums: A test of career tournament and internal labor market hypotheses. *Academy of Management Journal*, 34, 848–868.
- Connelly, B. L., Haynes, K. T., Tihanyi, L., Gamache, D. L., & Devers, C. E. (2016). Minding the gap antecedents and consequences of top management-to-worker pay dispersion. *Journal of Management*, 42(4), 862–885.
- Core, J., & Guay, W. (1999). The use of equity grants to manage optimal equity incentive levels. *Journal of Accounting and Economics*, 28(2), 151–184.
- Core, J., Holthausen, R., & Larcker, D. (1999). Corporate governance, chief executive officer compensation, and firm performance. *Journal of Financial Economics*, 51, 371–406.
- Cowherd, D., & Levine, D. (1992). Product quality and pay equity between lower-level employees and top management: An investigation of distributive justice theory. *Administrative Science Quarterly*, 37(2), 302–320.
- Cyert, R., Kang, S., Kumar, P., & Shah, A. (1997). Corporate governance and the level of CEO compensation. *Working Paper*. Carnegie Mellon University.
- Defond, M. L., Lim, C. Y., & Zang, Y. (2016). Client conservatism and auditor-client contracting. *The Accounting Review*, 91(1), 69–98.
- Demerjian, P., Lev, B., & McVay, S. (2012). Quantifying managerial ability: A new measure and validity tests. *Management Science*, 58(7), 1229–1248.
- Ding, D., Akhtar, S., & Ge, G. (2009). Effects of inter and intra-hierarchy wage dispersions on firm performance in Chinese enterprises. *International Journal of Human Resource Management*, 20, 2370–2381.
- Dybvig, P. H., & Warachka, M. (2012). Tobin's Q does not measure performance: Theory, empirics, and alternative measures. *Working Paper*. St. Louis: Olin School of Business, Washington University.
- Edmans, A. (2011). Does the stock market fully value intangibles? Employee satisfaction and equity prices. *Journal of Financial Economics*, 101, 621–640.
- Edmans, A. (2012). The link between job satisfaction and firm value, with implications for corporate social responsibility. *Journal of Management Perspectives*, 26(4), 1–19.
- Faleye, O., Reis, E., & Venkateswaran, A. (2013). The determinants and effects of CEO–employee pay ratios. *Journal of Banking and Finance*, 37, 3258–3272.
- Ferraro, P., Pfeffer, J., & Sutton, R. I. (2005). Economics language and assumptions: How theories can become self-fulfilling. *Academy of Management Review*, 30, 8–24.
- Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, 7(2), 117–140.

- Gerhart, B., & Rynes, S. L. (2003). *Compensation: Theory, Evidence, and Strategic Implications*. Thousand Oaks, CA: Sage.
- Gompers, P. A., Ishii, J. L., & Metrick, A. (2003). Corporate governance and equity prices. *The Quarterly Journal of Economics*, 118, 107–155.
- Guo, L., Libby, T., & Liu, X. K. (2017). The effects of vertical pay dispersion: Experimental evidence in a budget setting. *Contemporary Accounting Research*, 34(1), 555–576.
- Henderson, A. D., & Fredrickson, J. W. (2001). Top management team coordination needs and the CEO pay gap: A competitive test of economic and behavioral views. *Academy of Management Journal*, 44, 96–117.
- Homans, G. C. (1961). *Social Behavior: Its Elementary Forms*. New York, NY: Harcourt, Brace, & World.
- Jasso, G., Törnblom, K. Y., & Sabbagh, C. (2016). Distributive justice. *Handbook of Social Justice Theory and Research* (pp. 201–218). New York, NY: Springer.
- Kelly, K., & Seow, J. (2016). Investor reactions to company disclosure of high CEO pay and high CEO-to-employee pay ratio: An experimental investigation. *Journal of Management Accounting Research*, 28(1), 107–125.
- Lazear, E. P. (2000). Performance pay and productivity. *American Economic Review*, 90, 1346–1361.
- Levine, D. (1991). Cohesiveness, productivity, and wage dispersion. *Journal of Economic Behavior and Organization*, 15, 237–255.
- Montada, L., & Maes, J. (2016). Justice and self-interest. *Handbook of Social Justice Theory and Research* (pp. 109–125). New York, NY: Springer.
- Murphy, K. (1999). Executive compensation. In O. Ashenfelter, & D. Card (Eds.), *Handbook of Labor Economics* (pp. 2485–2563). Elsevier.
- Ortiz-Molina, H. (2007). Executive compensation and capital structure: The effects of convertible debt and straight debt on CEO pay. *Journal of Accounting and Economics*, 43(1), 69–93.
- Parmar, B. L., Freeman, R. E., Harrison, J. S., Wicks, A. C., Purnell, L., & De Colle, S. (2010). Stakeholder theory: The state of the art. *Academy of Management Annals*, 4(1), 403–445.
- Pevzner, M., Xie, F., & Xin, X. (2015). When firms talk, do investors listen? The role of trust in stock market reactions to corporate earnings announcements. *Journal of Financial Economics*, 117, 190–223.
- Piketty, T. (2014). *Capital in the Twenty-First Century*. Cambridge, Massachusetts London, England: Belknap Press of Harvard University Press.
- Rouen, E. (2020). Rethinking measurement of pay disparity and its relation to firm performance. *The Accounting Review*, 95(1), 343–378.
- Shaw, J. D., Gupta, N., & Delery, J. E. (2002). Pay dispersion and workforce performance: Moderating effects of incentives and interdependence. *Strategic Management Journal*, 23(6), 491–512.
- Siegel, P., & Hambrick, D. C. (2005). Pay disparities within top management groups: Evidence of harmful effects on performance of high-technology firms. *Organization Science*, 16, 259–274.
- Simmons, A. (2006). *Organizational Justice: A Potential Facilitator or Barrier to Individual Creativity*. Doctoral Dissertation Texas A&M University.
- Simon, D. H., & DeVaro, J. (2006). Do the best companies to work for provide better customer satisfaction? *Managerial and Decision Economics*, 27, 667–683.
- Smith, C. W., & Watts, R. L. (1992). The investment opportunity set and corporate financing, dividend, and financing policies. *Journal of Financial Economics*, 32, 262–292.
- Tantalo, C., & Priem, R. L. (2016). Value creation through stakeholder synergy. *Strategic Management Journal*, 37(2), 314–329.
- Toner, P. (2011). Workforce skills and innovation: An overview of major themes in the literature. *STI/OECD EDU Working Paper, SG/INNO*. Paris: OECD.
- Trevor, V., Reilly, G., & Gerhart, B. (2012). Reconsidering pay dispersion's effect on the performance of interdependent work: Reconciling sorting and pay inequality. *Academy of Management Journal*, 55(3), 585–610.
- Wade, J. B., O'Reilly, C., & Pollock, T. (2006). Overpaid CEOs and underpaid managers: Fairness and executive compensation. *Organization Science*, 17(5), 527–544.
- Walster, E., Berscheid, E., & Walster, G. W. (1978). *Equity: Theory and Research*. Boston, MA: Allyn & Bacon.
- Yermack, D. (1995). Do corporations award CEO stock options effectively? *Journal of Financial Economics*, 39, 237–269.
- Yermack, D. (1996). Higher market valuation of companies with a smaller board of directors. *Journal of Financial Economics*, 40, 185–211.