Is performance affected by the CEO-Employee pay gap? Evidence from Australia

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Abstract:

It is argued that pay inequality between CEO and employees impacts employee performance, while empirical studies are inconsistent about the directionality of the effect. This paper illustrates that seemingly contradictory predictions of sociological and economic perspectives about the impact of pay inequality are more supplementary than contradictory. We argue that pay inequality attributed to individuals' skills, company characteristics, and macroeconomic factors is positively associated with employee performance. However, its positive impact on employee performance declines at high levels of such pay disparity. Alternatively, pay inequality based on other unknown factors has a negative impact on employee performance. Data from a sample of public companies generally support our predictions.

Keywords: CEO compensation, pay inequality, pay ratio, employee performance, productivity

1 Introduction

The pay gap between executives and average employee pay has become an indicator of pay inequality between the top and bottom income levels, attracted considerable attention from news media, researchers, and regulators.[1] International news and business articles recommend that regulators reduce the pay inequality driven by executives' pay growth. Consequently, the issue of pay inequality leads to mandatory financial disclosure from regulators in some countries. For instance, the recent adoption of the Securities and Exchange Commission's (SEC) rule mandates all publicly listed U.S. firms to disclose the ratio of CEO's compensation to the median employee pay from 2017.[2] Similarly, quoted U.K. public companies with more than 250 U.K. based employees are required to disclose the ratio of their CEO's total remuneration to the 50th, 25th and 75th percentile of their U.K. employee remuneration from 2019.[3] The recently released report also recommends similar disclosures for public firms in Australia.[4]

While pay inequality in Australia is still below that of other countries such as the U.S., India and the U.K.,[5] it has been a concern.[6] [7] The gap between average CEO compensation and average weekly earnings in the top 100 publicly Australian listed firms (ASX100) has risen from 15.3:1 in 1993 to 51.4:1 in 2008, driven by the real growth in CEO compensation in this period (Baker and Denniss 2010; Productivity Commission 2009).[8] The Australian Government introduced the Remuneration Amendment Act, named the "two-strike rule" effective from Jul. 1 2011, to further

[1] The world scope data illustrates that the global income share of the top 1% increased from 16% in 1980 to 22% in 2000. Then, it declined slightly to 20% by 2016. However, the income share of the global bottom 50% has fluctuated around 9% since 1980.

[2] See https://www.sec.gov/news/pressrelease/2015-160.html

[3] See regulation 17 b in https://www.legislation.gov.uk/uksi/2018/860/part/3/made

[4] https://theconversation.com/australia-should-compare-ceo-and-average-worker-pay-like-the-us-and-uk-65898, https://www.pwc.com.au/publications/the-press/ceo-pay-wake-up-call.html, https://www.abc.net.au/news/2016-09-28/australia-should-compare-ceo-and-average-worker-pay-like-the-us/7884240

[5] https://www.statista.com/statistics/424159/pay-gap-between-ceos-and-average-workers-in-world-by-country/

[6] The business council of Australia (BCA) ,2004, Executive Remuneration, Position paper, June, Melbourne remarked: Rarely a week goes by without some commentary on CEO pay. Debate inevitably focuses on excessive amounts and comparisons with the pay of average wage and salary earners. (2004a, p. 1).

[7] The Australian Council of Trade Unions stated: Between 1990 and 2005, the average cash remuneration of CEOs in top 50 listed Australian companies has ballooned from a multiple of 18 times average full-time earnings to a multiple of 63. (sub. 82, p. 1).

[8] The productivity Commission's report also show that by around 13 per cent per year in real term from the early 1990s until around 1999. The growth rate decrease to the average annual real rate of 6 per cent over the period 2000-2007.

improve the accountability of executive pay.[9] As a result, the nominal average (highest) CEO pay for ASX100 has gradually increased from $4.7 (11.8) million in 2011 to $5.07 (16.4) million in 2019, which is still less than its peak of $5.5 ($ 33.5) million in 2007 (pre-GFC)[10]. In addition, pay inequality has fluctuated between 69.1 and 59.7 from 2012 to 2019.[11] While it appears that the 'two strikes' rule has moderated CEO pay rises at, or a bit below its peak[12], further policy intervention such as CEO-employee pay inequality disclosure could be as effective.

In addition to the media and regulators, researchers have recently joined the debate by positing that pay inequality, as the ratio of CEO compensation to average employee pay, impacts employees and firm performance (Faleye, Reis, and Venkateswaran 2013; Rouen 2020). However, its effect remains ambiguous (Conroy et al. 2014). On the one hand, some scholars find that pay inequality positively is associated with employee and firm performance (Banker, Bu, and Mehta 2016; Faleye et al. 2013; Mueller, Ouimet, and Simintzi 2017). The result is interpreted as consistent with the Tournament Theory (Lazear & Rosen, 1981) and Expectancy Theory (Lawler 1981), which assert that pay inequality motivates employees to increase their effort to gain higher compensation. On the other hand, other studies illustrate the negative relation between pay inequality and performance (Bebchuk, Cremers, and Peyer 2011; Cowherd and Levine 1992). Those find that the result is consistent with Equity theory (Adams 1965) and Relative Deprivation Theory (Crosby 1984; Martin and Murnighan 1981), arguing that employees compare their outcome with comparative referent and feel inequity and deprived if their outcome falls short of what they deserve.

Scholars (Conroy et al. 2014; Rouen 2020; Trevor, Reilly, and Gerhart 2012) argue that contradictory empirical findings can be attributed to undermining the determinant of pay inequality rather than the difference in theoretical prediction. They examine the impact of observed pay inequality without considering the impact of CEO and employee inputs (e.g., effort, responsibility,

[9] This rules included a provision that shareholders can vote to spill a board and force fresh elections if there have been 'no' votes of 25 per cent or more recorded against the remuneration report at two consecutive annual general meetings of the company.

[10] Based on Australian council of superannuation investors (ACSI) report, released in August 2020

[11] Average CEO compensation to average weekly earning form: Australian Bureau of Statistics (ABS), 'Table 2. Average Weekly Earings, Australia (Dollars)—Seasonally Adjusted'. Full-time adult average weekly ordinary time earnings seasonally adjusted

[12] There is evidence that similar 'say on pay' provisions in other countries have had a similar effect (Richardson 2018).

and skill), firm characteristics, and macroeconomic factors on pay inequality. By considering these factors, both perspectives seem compatible with each other (Rouen 2020). Pay inequality related to these factors may motivate employees to perform better, consistent with economic perspectives. In contrast, pay inequality attributed to unknown factors may lead to inequity and a feeling of deprivation. Consequently, it leads to detrimental activities such as quitting the company or shirking, consistent with the sociological perspective. Two seminal studies, Trevor et al. (2012) and Rouen (2020), mainly focus on this argument. In the sports setting, Trevor et al. (2012) assert that *horizontal pay disparity* explained (unexplained) by players' performance has a positive (negligible or slightly negative) impact on team performance. Rouen (2020) extends the Trevor et al. (2012) approach to pay inequality in organisational settings. He concludes that pay inequality created by explained (unexplained) compensation is positively (negatively) related to future firm performance.

Their research offers little clear guidance about the consequences of pay inequality on employee performance. Furthermore, although Tournament Theory is conceptualised as a contest with an optimal prize that can maximise the employee's output (Connelly et al. 2014; Lazear and Rosen 1981), examining the possible threshold of pay inequality is almost absent from the literature. This paper aims to extend their integrating contradictory perspective approach into the relationship between pay inequality and employees performance by investigating three questions. First, what is the overall impact of pay inequality within the firm on employees' performance? Second, whether distinguishing between pay inequality explained by an individual's skill, firm characteristics, and macroeconomic factors (from here pay equity) and unexplained pay inequality (from here pay inequity) can reconcile sociological and economic perspectives? If yes, what different impacts has each of them had on employees' performance? Moreover, last, is there an optimum point for pay equity, which maximises employee performance?

To conduct our investigation, we first break down pay inequality into pay equity and pay inequity. Second, we then investigate the impact of pay equity and pay inequity on employee performance. We analyse a sample of all Australian listed companies that meet data availability restrictions over 2004-2019. Our primary measure of pay inequality is (the natural log of) the ratio of total CEO compensation to average employee pay. Our dependent variable is employees' productivity. We focus on employee performance because it offers significant insights into evaluating how pay inequality affects employees' incentives and behaviour (Faleye et al. 2013).

Our empirical analysis is divided into two parts. In the first part, the determinants of pay inequality are examined. Then the pay equity is defined as predicted pay inequality by our model and pay inequity as the model's residual. In the second part, we investigate the impact of pay inequality on employee performance. Our results illustrate that employee performance is negatively associated with pay inequality. Then, we conduct further analysis based on the decomposition of pay inequality into pay equity and pay inequity. We find that pay inequity has a strongly negative impact on employee performance. In addition, there is an inverted-U shape relation between pay equity and employee performance. Our result suggests that both perspectives can be supported by considering the role of input in our analysis.

Our study contributes to the academic literature on pay inequality and has implications for financial regulators and managers. First, we extend the existing approach (see Trevor et al. 2012) to the relation between vertical pay disparity and individual performance in an organisation setting. Second, we extend the empirical studies on Tournament Theory in organisation settings by illustrating that either very high or very low pay equity cannot motivate employees to increase their performance, and there is an optimum point. Third, although pay differences in Australia get some media attention recently, there is no research investigating the pay inequality impact on employee performance in this country, according to the literature done so far. Finally, our findings can help managers design a compensation system and recommend regulators that CEO pay ratio disclosure per se without putting them into equity context may lead to misinterpretation.

The remainder of this paper is structured as follows. The following section provides the literature review and develops the key hypothesises. The methodology is discussed in section 3, followed by our sample selection and empirical analysis in sections 4 and 5, respectively. The last section contains our conclusion.

2 Literature Review and Hypothesis development

Individuals in an organisation are paid differently, and these differences influence their attitudes and performance. These pay differences are categorised into three types- vertical pay disparity defined as pay differences across hierarchy levels in a corporation; horizontal pay disparity defined as pay differences among people holding the same job; and overall pay disparity, which combines both vertical and horizontal pay disparity (Gupta, Conroy, and Delery 2012). Wade, O'Reilly, and Pollock (2006) find evidence that CEOs pay is a salient reference for employees in determining

the fairness of their pay. Thus, the pay disparity between CEO and the average employee has an impacts on their reactions to their compensation. This study concentrates on pay inequality as a type of vertical pay disparity. However, the literature review includes more broad vertical pay disparity (between different hierarchy organisation levels) and critical horizontal pay disparity studies for more elaboration.

2.1 Theoretical background

The impact of pay disparity in an organisation has been conceptualised from both sociological and economic perspectives (Conroy et al. 2014). The sociological standpoint, mainly Equity Theory and Relative Deprivation Theory, predicts that pay disparity negatively impacts employee performance (Faleye et al. 2013). Equity Theory states that individuals judge the fairness of their exchange relationships with their organisation by comparing the ratio of their inputs (e.g., ability, intelligence, education, effort) into the exchange to their outcome (e.g., compensation, security, promotion) with other‘s ratio (Adams 1965; Homans 1974; Walster, Berscheid, and Walster 1973). Therefore, inequity exists when their perceived ratio of inputs to outcomes are inconsistent with others. The presence of inequity in person creates tension, and the tension will drive individuals to reduce inequity (Adams 1965). They reduce it through three actions, changing their perceptions of their own or their reference group’s input and outcome, altering their actual inputs or outcome, or leaving their companies (Cowherd and Levine 1992). Similarly, the Relative Deprivation Theory argues that people feel relatively deprived when they have received less than what they deserve relative to their references. Their experience of deprivation leads to lower satisfaction and quitting the job (Levine 1991).

On the other hand, the economic perspective argues that pay disparity positively impacts employees’ motivation and leads to better performance (Conroy et al. 2014). Tournament Theory and Expectancy Theory are two significant theories in this perspective that explain how employees can be induced by larger pay disparity. Tournament theory assumes that greater pay disparity between hierarchy levels in a corporation puts employees in a competition for the prize of ultimate pay at the CEO level. Consequently, lower-level employees are motivated by the higher pay at higher organisation levels and exert increased effort to raise the corporate ladder. Similarly, the Expectancy Theory argues that employee’s motivation stems from the interplay among three factors, and three must be strong. Employees must want an outcome such as pay, believe that

increased effort will lead to the required performance level, and believe that performance will lead to the desired outcome. Then, they will be motivated to perform.

Both perspectives are applicable in vertical pay disparity. Top executives are likely to serve as a vital referent for lower-level employees in determining whether their pay is fair because executives' actions are salient to organisational participants (Shin et al. 2015; Wade, O'Reilly, and Pollock 2006). Hence, the sociological perspective is critical in studying vertical pay disparity (Cowherd and Levine 1992; Gupta et al. 2012). Concerning the economic perspective, Tournament theory is mainly designed for vertical pay disparity between hierarchy organisation levels (Gupta et al. 2012). Moreover, the expectancy theory is primarily applied in horizontal pay disparity, but it can be extended to vertical pay disparity (Conroy et al. 2014).

2.2 Experimental background

Some studies support sociological perspectives in examining the impact of pay disparity to argue that large pay disparity leads to inequity perception, lower employees' morale and encourages them to take detrimental action such as shrinking or quitting (Akerlof and Yellen 1990; Chen and Sandino 2012; Corneliben, Himmler, and Koenig 2011). For example, some studies illustrate that pay disparity among employees increase absenteeism (Mahy, Rycx, and Volral 2016) and is associated with higher turnover among lower-level paid (Bloom and Michel 2002; Jia et al. 2014; Messersmith et al. 2011; Shaw and Gupta 2007; Wade et al. 2006). This perspective is also extended to the final consequence, negative impact on firm performance. It is shown that the vertical pay disparity is detrimental to firm performance (Bebchuk et al. 2011; Chen, Huang, and Wei 2013; Cowherd and Levine 1992). In contrast, other studies uncovered evidence in favour of the economic perspective that large pay disparity between hierarchy levels in an organisation provides incentives for lower levels to increased effort and performance (DeVaro 2006; Ehrenberg and Bognanno 1990; O'Reilly et al. 1993). This perspective is also extended to firm performance, and it is shown that the competition among employees is beneficial to firm performance (Banker et al. 2016; Heyman 2005; Kale, Reis, and Venkateswaran 2009; Lallemand, Plasman, and Rycx 2004; Lee, Lev, and Yeo 2008; Mueller et al. 2017).

Although most empirical studies have focused on disparity among executives (or supervisors and their direct reports), recent studies attempted to examine the pay disparity between CEO and the average employee pay show the contradictory result (Rouen 2020). Employees are likely to

use CEO pay as a reference in determining the fairness of their compensation Since CEO actions are salient to organisation participants and detailed information on CEO's pay are accessible from public sources (Wade et al. 2006). According to Kulik and Ambrose (1992), regardless of the reference group (upper level or same level), individuals feel inequity if they perceive that the ratio of their inputs to outcomes is unequal to their referents. Hence, high pay inequality between CEO and employee can lead to the feeling of inequity. High pay inequality may create negative emotions among employees, leading to job dissatisfaction, lower employee productivity (Pfeffer 2007) and lower firm performance (Shin et al. 2015). On the other hand, Faleye et al. (2013) find that employee productivity increases with relative pay when the firm has fewer well-informed employees. They also find that firm value and operating performance both increase with relative pay.

2.3 The elaboration of contradictory perspectives

Prior studies did not provide clear guidance about the pay disparity impact (Connelly et al. 2016; Conroy et al. 2014; Gupta et al. 2012). Recent studies argue that sociological and economic perspectives are more supplementary than contradictory (Ridge, Aime, and White 2015; Shin et al. 2015). Therefore, they attempt to introduce a complementary approach. The first approach asserts a curvilinear relation between pay disparity and outcome rather than linear. As a result, some studies illustrate the U-shape relationship when examining the impact of pay disparity among workers (Grund and Westergaard-Nielsen 2008; Mahy, Rycx, and Volral 2011), or pay disparity between CEO and top management teams on firm performance (Ridge et al. 2015). They show the decreasing (increasing) performance as pay disparity increases up to (decreases from) turning point, Consist with sociological (economic) perspective. Alternatively, other studies find an inverse-U shape relationship between pay disparity among CEO and employee (Dai, Kong, and Xu 2017) or pay difference among employees (Mahy et al. 2011; Winter-Ebmer and Zweimüller 1999) and employee performance. While Shin et al. (2015) include the squared pay multiple to reflect a potential concave relation between firm performance and CEO-employee pay disparity, the square term was insignificant. Although evidence suggests that the relationship of pay disparity and outcomes may be curvilinear, contradictory finding in these studies makes general conclusions difficult.

The second approach argues that contradictory findings in prior studies stem from overlooking individuals inputs in their compensation (equating pay inequality with pay inequity) (Conroy et al. 2014; Gupta et al. 2012; Shin et al. 2015; Trevor et al. 2012), which is incompatible with critical assumptions in both perspectives. In the recent decade, scholars attempt to consider individuals' inputs in their experimental studies. Therefore, some studies employ control variables that explain employees inputs (such as their talent and previous pay) in their model (Gerhart and Rynes 2003). However, this procedure removes sources of pay disparity and is thus a sub-optimal approach (Gupta et al. 2012). Therefore, studies using such control variables should be interpreted as studies of pay inequity. Other studies argue that pay disparity related to legitimate reasons leads to higher productivity, consistent with economic perspectives. However, pay disparity for illegitimate reasons is unlikely to yield these benefits. Following this approach, it is shown that pay-performance pay disparity is positively related to performance (Kepes, Delery, and Gupta 2009; Shaw, Gupta, and Delery 2002). Some studies also examined the impact of pay inequity. For example (e.g., Shin et al. 2015; Faleye et al. 2013) model the determinant of vertical pay disparity and estimate unexplained vertical pay disparity as the residual of their model.[13] Shin et al. (2015) found a negative relation between absolute pay inequity and future firm performance. However, Faleye et al. (2013) did not find any significant relation between pay inequity and employee performance.

Two studies attempt to consider both pay equity and inequity in their examination. Trevor et al. (2012) study horizontal pay disparity within an interdependent sport team and find that teams with high pay disparity created by variation in the individual performance of team members will have higher team performance, while team performance reduces at the high level of disparity. He also shows that disparity unexplained by individual performance will have a negligible or slightly negative impact. Rouen (2020) separate the component of CEO and employee compensation explained by their inputs and economic factors separately. He defines pay disparity as the ratio of predicted CEO pay to expected average employee pay and unexplained pay disparity as the difference between the actual pay disparity and the calculated pay disparity. He finds robust evidence of a negative (positive) relation between unexplained (explained) pay disparity and future

[13] Although the main argument of both studies was the impact of simple vertical pay disparity on performance, they also examine the impact of the residual (*PayInequity*) on *firm performance* (Shin et al. 2015) and *employee performance* (Faleye et al. 2013).

firm performance. Therefore, the role of inputs in measuring pay inequality should be demonstrated. Absent such a demonstration, the impact of pay inequality on performance could lead to an invalid approach for applying those theories (Rouen 2020).

2.4 The impact of pay inequality on employee performance

As argued, pay inequality per se is an insufficient proxy to test the sociological and economic perspective. Therefore, this study intends to focus on pay inequity and pay equity impact on employee performance rather than pay inequality. Consistent with the sociological perspective, we expect that pay inequity negatively influences employees' performance. This leads to the first hypothesis stated as follows:

H1: Pay inequity has a negative association with employee performance.

Regarding the previous studies, it is expected that pay equity positively relates to employee performance. However, a critical idea underlying Tournament Theory is the presence of optimal pay disparity. Tournament Theory is designed as a contest in which actors compete for the prize awarded based on relative rank (Connelly et al. 2014). The optimal pay disparity is the level that can maximise the employees' performance in a contest (Lazear and Rosen 1981). If pay disparity is too small, contestants are not incanted to compete so that the total productive output of the tournament drops. However, a high prize spread can also be detrimental because it induces high effort that contestants cannot fulfil (Connelly et al. 2014). Therefore, Tournament design involves strategically choosing optimal pay disparity spreads that maximise the productive output of the tournament. The empirical literature rarely refers to the existence of an optimum point for pay equity. For example, (Brown, Sturman, and Simmering 2003) assert that pay disparity clearly explained by inputs may be seen as inequitable and detrimental when it is so large. Trevor et al. (2012) also find that the positive impact of horizontal pay disparity, which is explained by their inputs, on team performance, is attenuated at high levels of such dispersion. Therefore, this argument leads to our second prediction:

H2: Pay equity has an inverted-U shape association with employee performance

3 Methodology

Given our argument, Pay inequality per se is not a reliable measure to examine its impact on performance. There is a need to consider the determinant of pay inequality to separate pay inequality from pay inequity. This section first describes our model to measure pay inequality explained by CEO and employee skill, company characteristics, and macroeconomic factors. Therefore, we disentangle the components of each firm-year pay equity from pay inequity. Second, the model to examine the impact of the key pay ratios (pay inequality, pay equity and pay inequity) on employee performance is explained.

3.1 The breaking down pay inequality into pay equity and pay inequity

By following the empirical studies approach (e.g., Faleye et al., 2013; Shin et al., 2015), we model pay inequality based on the CEO and employees' skill, company characteristics and macroeconomic factors equation 1. Pay equity is the predicted pay inequality in each firm-year, while the error term ε captures pay inequity and represent the deviation from the expected PayInequality.

$$
\begin{aligned}
Pay\ Inequality_{i,j,k,t} &= \alpha + \sum_{a} \beta_a CEO\ Skills_t + \sum_{b} \beta_b Employees\ skills_t + \sum_{a} \beta_a Company\ charactristic_t \\
&+ \sum_{b} \beta_b\ Macroeconomic\ factors_t + Region\ Fixed\ Effects + Industry\ Fixed\ Effects \\
&+ Year\ Fixed\ Effects + \varepsilon_{i,t} \qquad (1)
\end{aligned}
$$

In the above equation, pay inequality is calculated by the natural logarithm of the ratio of the total CEO compensation to the mean employee's pay during the fiscal year[14]. Industries are defined as two-digit Global Industry Classification Standard (GICS) code. Subscribe *i* is the firm identifier, j is industry identifier, k is the region identifier, and *t* is the fiscal year.

[14] We used total CEO remuneration to forecast expected CEO remuneration for two reasons. Firstly, our sample is not limited to large corporations where the executive's salary is broken down into fixed salary, non-cash benefits and contingent benefits normally in the form of bonuses. Secondly, in cases of CEOs' salary breakdown availability, there is a large number of zero bonuses. Labour expenses also include wage and salaries, superannuation and share-based payment.

Following the prior study (Core, Holthausen, and Larcker 1999), highly skilled CEO are required in larger firms with more complex operations and greater growth opportunities and firm performance. Firm size and operation complexity are measured by the natural logarithm of revenue (*LnRevenue*). Firm age is included (*LnAge*) to measure the complexity of a firm's operation. The firm's age is the natural logarithm of the current fiscal year minus the listed year in the Australian Securities Exchange (ASX). The book to market ratio (*BTM*) is used as a proxy of growth opportunity.

Moreover, based on standard agency models, the CEO's compensation is an increasing function of firm performance. Firm performance is measured using the accounting return on asset (*ROA*), the ratio of earnings before interest and taxes to the average of total asset, and annual stock return (*Ret*), the natural logarithm of return during the fiscal year (Core et al. 1999). Furthermore, it is expected that firms with noisier environments, computed by the standard deviation of common stock returns over the prior five years (*RetVar*), provide higher incentives to attract talented managers (Bloom and Michel 2002; Core et al. 1999). These variables are expected to be positively associated with pay inequality. In addition, the capital structure (*Leverage*), measured by total long-term debt scaled by the total asset, is included to control pay inequality. *Leverage* may be negatively associated with compensation because it decreases companies' ability to make their payroll. Whereas leverage can be positively correlated with compensation since potential bankruptcy costs arising from high leverage should be compensated by higher pay (e.g., Berk et al., 2010; Chemmanur et al., 2013). Therefore, the sign of its impact on pay inequality is not predicted (Rouen 2020; Shin et al. 2015).

Furthermore, executives income increases by their bargaining power toward board members, and their bargaining power decrease by effective corporate governance (Core et al. 1999). The CEO has higher bargaining power when the CEO is the board chair (Core et al. 1999; Faleye, Hoitash, and Hoitash 2011; Yermack 1996) because they are more entrenched, more experienced or more talented (Faleye et al. 2013). Therefore, CEO-Chair duality (*IsCEOChair*), an indicator equal to one if the board chair is also the CEO and zero; otherwise. Board tenure (*BoardTenure*) and the percentage of independent board members on the compensation committee (*IndCommittee*) are included in the model. We expect a positive relation between these variables and corporate governance effectiveness.

Employees skill is measured by three ratios including, R&D intensity, physical capital intensity and workforce education (Faleye et al. 2013). R&D intensity (*RDIntensity*) is calculated as the ratio of R&D expenditures to total asset. Physical capital intensity (*PPTIntensity*) is net property, plant and equipment per employee in a million dollars, and workforce education (*Education*) is measured by the percentage of the population who hold at least a bachelor's degree in each region. These three ratios consider two different factors for the presence of highly skilled employees in the firm, task-based reasons such as executing R&D projects and operating high capital, or individual-based reasons, including their knowledge level. To put it differently, Firms with high R&D projects require highly skilled employees to execute those projects (Faleye et al. 2013; Toner 2011). Additionally, capital-intensive firms with high net property, plant and equipment per employee need highly skilled employees to operate. Also, we use workforce education to measure the level of human capital (Barro 2001). This variable is calculated at the regional level because of data limitations.

Furthermore, Macroeconomic variables, which influence employees' bargaining power toward the executives, are included. Industry concentration (*IndConcentration*), measured by revenue-based Hirschman–Herfindahl index over Datastream firms in the two-digit GCSI industry[15], determine market competitiveness. A highly concentrated industry shows a monopoly, which decreases employees outside opportunity and bargaining power. Employee unionisation (*Union*) is measured as the percentage of employees who are members of a trade union in each region[16]. The unemployment rate (*UnemploymentRate*) is the ratio of those looking for a job to the labour force in each region. The vacant job ratio (*VacantJob)* measures the percentage of vacant jobs to total jobs in each industry each year. [17] We expect that bargaining power increase with employee unionisation and decrease with industry concentration, unemployment rate and vacant job ratio.

[15] Revenue is winsorized at the 5 and 95 percentiles to remove the effect of outlier in the calculation of Hirschman–Herfindahl index.

[16] The trade union members data is collected from Australian Bureau of Statistic (ABS) which is presented at region level

[17] Another proxy, considered in the literature as a proxy of outside opportunity, is industry homogeneity. It is calculated as the mean partial correlation between firms' return and equally weighted industry index. In this study, this variable is not included because the lack of the data on equally weighted GICS industry index.

3.2 The impact of pay ratios on employee performance

By following Faleye et al. (2013) equation, we examine the impact of key pay ratios (pay inequality, pay equity and pay inequity) on employee performance using the below multivariate regression.

$$
\begin{aligned}
&Employee\ Performance_{i,k,t} \\
&\quad = \alpha + \beta_1 PayRatio_{i,t} + \beta_2 LnAveEmployeePay_{i,t} + \beta_4 Education_{i,k,t} \\
&\quad + \beta_5 PPEIntensity_{i,t} + \beta_6 IndConcentration_{i,j,t} + \beta_7 Union_{i,k,t} + \beta_8 CEOTenure_{i,t} \\
&\quad + \beta_9 LnRevenue_{i,t} + \beta_{10} Leverage_{i,t} + Region\ Fixed\ Effects \\
&\quad + Industry\ Fixed\ Effects + Year\ Fixed\ Effects + \varepsilon_{i,\ t} \quad (2)
\end{aligned}
$$

Where subscripts are defined as in the previous equation. Employee performance is measured as Total Factor Productivity (TFP) and the natural logarithm of revenue per employee (SLE). The primary variable of interest is *PayRatio*, which is either pay equity, pay inequity or pay inequality. The later discussion can then include pay inequality to make comparisons with previous studies. Similar to prior studies, we control other factors affecting employee performance, including employee skills, outside employees' opportunities, and firm characteristics. We expect that employee productivity increases with skill and outside opportunities. We measure employees' skilled using PPE intensity (*PPTIntensity*) and Employee Education (*Education*). Outside employees opportunity is also measured by Industry concentration (*IndConcentration*) and employee unionisation[18]. The regression also includes the impact of the average employee compensation (*LnAveEmployeePay*), CEO experience (*CEOTenure*), firm's size (*LnRevenue*) and capital structure (*Leverage*). Finally, we control year, two-digit GICS industry, region fixed effects. Appendix A defines all variables used in our empirical analysis.

Total Factor Productivity (*TFP*) is calculated following Faleye et al. (2006), where it is assumed that the firms' production function follows the Cobb-Douglas formula:

$$Y_{i,t} = A\, L_{i,t}^{\beta_j} K_{i,t}^{\alpha_j} \quad (3)$$

$Y_{i,t}$ is the revenue, $L_{i,t}$ is the number of employees, and $K_{i,t}$ is the net property, plant, and equipment of firm i in fiscal year t in industry j. We transformed the above equation by taking the

[18] Union may has positive or negative impact on employee performance (Faleye et al. 2013).

natural logarithm of both sides. We estimate a separate regression for each two-digit GICS industry group for all Datastream firms to control industry heterogeneity. Each regression includes a year-fixed effect, and the standard error is corrected by firm-level clustering. Finally, *TFP* is measured as the residual of the following equation.

$$y_{i,t} = \alpha_{i,j,t} + \beta_j l_{i,t} + \alpha_j k_{i,t} + \varepsilon_{i,t} \quad (4)$$

TFP defines employee performance as the portion of firm productivity that is unaffected by capital. For robustness purpose, this study considers an additional employee performance proxy, measured as the natural logarithm of the revenue per employee (*SLE*) (Cronqvist et al. 2009). However, this measure captures productivity at the most basic level (Faleye et al. 2013).

Our model may face the challenge of potential endogeneity bias that drives the effect of pay ratios on employee performance. Noting the possibility of persistence in employees' performance that the current value being related to its previous value, we use the "system generalised method of moments (SGMM)" (Arellano and Bond 1991; Arellano and Bover 1995) to capture the dynamic behaviour. Furthermore, SGMM controls for the unobserved heterogeneity, the endogeneity problem arising from simultaneity, reverse causality or mismeasurement of variables that may bias estimates. These strategies are further explained in the empirical analysis section.

4 Sample and data

Our sample includes Australian Securities Exchange (ASX) firms and Australian regional macroeconomic data collected from three databases: Thomson Reuters Datastream (TRD), MorningStar (DatAnalysis), and Australian Bureau of Statistics (ABS). TRD provides detailed annual reports and stock market data. Other detailed company information (such as an address, industry group) are available in DatAnalysis. ABS covers a wide range of macroeconomic data by region and industry in Australia. All three databases are merged, as discussed below, to develop a final firm-year dimensional database used in this study.

Most of the variables are collected from TRD and ABS. TRD includes our interest variables in this research, CEO compensation and employees' average compensation. The CEO's

compensation is defined in the TRD database as the highest remuneration in the incorporation[19]. Employees' average compensation is calculated as the ratio of wage and salaries expenses minus the highest remuneration to the number of employees minus one[20]. Since these two variables are our key variables, the firms in our initial sample are restricted to those with at least one observation of the highest remuneration package or wage and salaries expenses from 2004 to 2019. This step yields a list of 2845 companies that are listed in ASX from 2004 to 2019. Then, financial data are collected from 2004 to 2019 for all 2845 firms. Moreover, regional and industry-level data on Australia's economy, labour, population, and education are collected from ABS.

In order to merge TRD and ABS databases, industry groups and the state of incorporation identifiers are required for all firms. However, there are two issues. First, the state of incorporation for all companies and the two-digit GICS code[21] is not available in TRD. To address this problem, DatAnalysis is employed. The country of incorporation, registered office state and GICS for all companies are retrieved from DatAnalysis. Then, the missing values of the country of incorporation and registered office state in TRD are filled using data from DatAnalysis. This process leads to 2649 firms being incorporated in Australia. In addition, we merged a two-digit GICS industry code to our sample based on the company name. The two-digit GICS industry code was not reported for 26 companies. This process reduces the number of our companies to 2623**.**

The second issue is that the industry identifier differs in DatAnalysis and ABS. The former uses GICS and the latter ANZSIC. Thus, merging our sample and ABS database turns to another challenge. To solve this problem, we relate each two-digit GICS industry code to a two-digit ANZSIC code. If the exact match is not possible in the two-digit ANZSIC code, we use the broadest level of ANZSIC code that potentially maps to the GICS industry code. Appendix B illustrates the industry map. Given these steps, our initial sample leads to 2623 unique firms incorporated in Australia from 2004 to 2019.

[19] In Australia, the remuneration of key management and board member is announced in the annual report from 2004. The CEO compensation is reported in TRD based on the U.S. dollar. Therefore, we also collect the USD/AUD currency rate from TRD. We calculate CEO compensation in AUD by multiplying CEO compensation in USD by the currency rate in the fiscal date of each firm-year.

[20] If number of employee was missing I used the employee number from previous year

[21] The Australian stock exchange (ASX) uses the GICS method for categorising companies.

Unfortunately, TRD does not provide complete compensation data for the CEO. Therefore, our sample is limited to those observations in our initial sample that covered CEO Compensation, Total Senior executive compensation or board member compensation.[22] Consequently, we lose a significant proportion of the observations obtained from Datastream, resulting in a final sample of 547 unique firms over 2004-2019, equivalent to a 4032 firm-year observation. Then, we winsorise our sample data at the 1 per cent and 99 per cent levels for all the continuous variables to minimise the effect of any outliers.[23] Following all adjustments, the sample size reduces to 2132 firm-year observations (385 unique firms) in our first regression (see Table 4).

5 Empirical Analysis

This section begins with the summary statistic of all variables. It follows by estimating pay equity and pay inequity according to equation 1. We then discuss and test our hypothesises on the relation between pay ratios (pay inequality, pay inequity, and pay equity) and employee performance.

5.1 Descriptive statistics

Table 1 presents the mean and median of pay inequality over years, industries and regions. As shown in panel A, The median (mean) of pay inequality is increased from 34.9 (50.94) to 47.64 (88.47) from 2004 to 2007 (before GFC). After GFC, the pay inequality gradually declined and reached 18.31(38.82) in 2010. From 2011, pay inequality has been more stable. [24] In addition, the median of pay inequality is higher in Bank, insurance, transportation and retail industries, where the CEO earns about 49, 41, 36.16 and 35.04 times more than the average employee pay, respectively (Table 1, panel B). Comparing pay inequality over different regions in Australia shows that two states, New South Wales and Victoria, has the highest median pay inequality with

[22] We also consider Total Senior executive compensation or board member compensation to check later that it is possible hand collect CEO. If we just restrict on CEO the number of observation was 543 unique firm and 3882 observation.

[23] The outliers in variables may turn the distribution to non-normal affecting the descriptive statistics.

[24] The trend of pay inequality in our sample is consistent with "the productivity Commission's report" in 2009 and "Australian council of superannuation investors (ACSI) report" in August 2020.

respective values of 26.10 and 28.69. However, median pay inequality is lower in Northern Territory and Western Australia with respective values of 2.25 and 10.69 (Table 1, panel C). Our sample does not show the pay inequality reported in the media. This discrepancy exists mainly as a consequence of our measure of pay inequality. Because of the lack of executives' compensation data, our average employee pay includes executive salaries. This leads to higher average employee pay and lower pay inequality.

Table 1 Pay Inequality over years, industries and regions

Panel A: Pay Inequality over years

Year	Number of firms	Mean	1st Quartile	Median	3rd Quartile
2004	30	50.94	16.34	34.90	65.00
2005	36	50.45	22.18	43.33	65.35
2006	51	69.20	29.42	50.54	78.19
2007	56	88.47	31.16	47.64	79.34
2008	67	70.76	28.36	42.07	82.47
2009	137	45.62	10.59	26.13	54.82
2010	194	38.82	6.58	18.31	46.14
2011	205	50.73	6.64	21.54	47.63
2012	217	42.14	8.39	22.72	48.22
2013	236	33.97	7.47	19.52	36.96
2014	237	33.24	7.10	16.64	40.80
2015	256	35.03	7.68	18.77	41.74
2016	269	32.93	9.25	18.81	35.97
2017	281	35.02	10.17	19.31	41.00
2018	284	33.71	9.86	20.14	38.01
2019	274	37.21	9.33	19.50	35.93

This table presents the mean and the median of pay inequality over the period 2004–2019. Pay inequality is calculated as CEO compensation to average employee compensation.

Panel B: Pay Inequality over different industries

Industry	Firm-year observation	Mean	1st Quartile	Median	3rd Quartile
Semiconductors & Semiconductor Equipment	14	5.64	3.25	5.27	6.71
Technology Hardware & Equipment	18	10.89	9.48	10.72	12.11
Household & Personal Products	17	15.79	10.04	14.66	17.03
Software & Services	116	16.07	6.93	12.58	19.49
Consumer Durables & Apparel	26	19.87	10.11	12.18	14.27
Utilities	63	20.47	4.00	12.01	33.93
Pharmaceuticals, Biotechnology & Life Sciences	75	21.67	4.09	7.33	15.79
Diversified Financials	168	21.88	8.83	18.85	26.52
Energy	250	23.14	4.15	10.68	27.10
Media & Entertainment	107	28.03	12.38	20.21	35.22
Commercial & Professional Services	150	30.64	9.18	17.35	46.57
Real Estate	148	35.93	12.47	24.66	51.11
Consumer Services	171	36.02	12.38	23.41	50.09
Automobiles & Components	19	36.67	4.84	8.74	27.09
Telecommunication Services	45	39.62	17.45	32.90	58.62
Capital Goods	168	45.67	8.65	19.44	41.03
Insurance	49	47.59	35.79	41.00	64.43
Transportation	90	49.67	25.17	36.16	66.51
Health Care Equipment & Services	126	50.03	15.52	25.51	58.50
Materials	651	50.39	7.78	23.28	54.06
Banks	100	59.00	28.03	49.94	82.15
Retailing	147	60.81	21.23	35.03	59.29
Food, Beverage & Tobacco	76	68.23	10.36	16.46	30.89
Food & Staples Retailing	36	76.83	20.62	34.91	138.48

This table presents the mean and median pay inequality over the 2004–2019 in different industries, two-digit GICS code. Pay inequality is calculated as CEO compensation to average employee compensation.

Panel C: Pay Inequality over regions

Region	Firm-year observation	Mean	1st Quartile	Median	3rd Quartile
NSW	1006	43.79	13.72	26.10	51.42
VIC	729	44.88	12.70	28.69	58.60
QLD	351	24.55	7.69	16.74	27.66
SA	100	19.91	10.13	14.24	23.60
WA	615	40.44	5.68	10.69	28.50
TAS	17	55.67	11.90	14.90	27.87
NT	12	2.44	2.12	2.25	2.91

This table presents the mean and the median of pay inequality over the period 2004–2019 in different region. Pay Inequality is calculated as CEO compensation to average employee compensation.

Table 2 provides descriptive statistics for all variables in this study. The mean and the median of pay inequality are about 3.018 and 3.054.[25] Turning to employee performance, the mean (median) of total factor productivity (TFP) and revenue per employee (SLE) is 0.372 (0.229) and 6.175 (6.205). Regarding corporate governance, we find that about 10% of our sample firms have dual CEO Chairman positions. Moreover, on average, 82% of the compensation committee members are independent board members.

Table 2 Summary statistic of all variables

	Obs	Mean	S.D.	Min	1st Quartile	Median	3rd Quartile	Max
Pay inequality	2830	3.018	1.143	0.307	2.222	3.054	3.804	6.790
Pay equity	2132	3.000	0.707	-0.007	2.552	3.024	3.513	5.280
Pay Inequaity	2132	0.000	0.877	-2.875	-0.553	-0.037	0.472	3.891
TFP	3454	0.372	1.175	-3.515	-0.360	0.229	1.084	4.349
SLE	3472	6.175	1.387	-0.324	5.456	6.205	6.969	10.217
LnAveEmployeePay	2937	11.511	0.987	7.494	11.075	11.524	11.927	15.143
LnRevenue	3864	5.893	2.542	-2.364	4.950	6.203	7.554	10.833
BTM	3892	0.760	0.658	-0.102	0.326	0.585	0.980	4.348
LnAge	3924	2.543	0.878	-0.587	2.103	2.613	3.141	4.208
ROA	3879	2.234	15.931	-87.400	-0.510	5.230	9.870	46.880
Ret	3780	0.010	0.479	-1.696	-0.215	0.068	0.285	1.342
STDRet	3445	0.134	0.072	0.038	0.080	0.115	0.176	0.435
Leverage	3947	15.866	15.148	0.000	0.294	13.526	26.066	71.935
IsCEOChair	4032	0.105	0.307	0.000	0.000	0.000	0.000	1.000
CEOTenure	3460	5.835	2.705	0.880	4.000	5.395	7.150	16.060
BoardTenure	3886	5.824	2.752	0.880	3.940	5.380	7.160	16.060
IndCommittee	3848	82.662	23.797	0.000	67.000	100.000	100.000	100.000
PPEIntensity	3491	2.565	8.037	0.000	0.029	0.135	1.056	83.402
RDIntensity	3964	0.456	2.095	0.000	0.000	0.000	0.000	21.252
IndConcentration	4001	0.094	0.103	0.023	0.036	0.065	0.108	1.000
Education	4032	19.880	3.014	11.327	17.446	19.834	22.228	24.845
Union	4032	13.967	2.375	10.419	12.157	13.710	15.860	22.263
Unemployment	4032	5.390	0.666	2.962	4.825	5.376	5.897	7.697
VacantJob	4032	2.153	1.160	0.316	1.305	1.851	2.653	5.231

This table presents summary statistics for the main variables in our samples. All variables are defined in Appendix A.

Table 3 presents the Pearson correlation matrix for the firm-level and macroeconomic variables. Regarding our pay ratios, there is a strong positive relation between pay inequality and pay equity at 0.62. Similarly, the correlation between pay inequality and pay inequity is significantly positive

[25] Unlogged pay inequality is equal to 20.45 and 21.20. Therefore, we use the natural log of p in our analyses to reduce the influence of outlier.

at 0.78. However, the correlation between pay inequity and pay equity is slightly negative, consistent with prior research (Rouen 2020). In addition, higher mean employees pay is associated with lower pay ratios. As we expected, there is a positive correlation between firm size (*LnRevenue*), firm performance (*ROA* and *Ret*) and pay inequality. Unsurprisingly, pay inequity is not highly correlated with our control variable. Consistent with our hypotheses H1 and H2, there is a positive correlation between pay equity and *TFP* (*SLE*) at 0.08 (0.22) and a negative correlation between pay inequity and *TFP* (*SLE*) at -0.35 (-0.38). As it is shown, none of the variables is highly correlated, and the most significant correlation coefficient is 0.58 between *Union* and *Education*.

Table 3 Correlation Matrix

Panel A: from variable Pay inequality to STDRet

	1	2	3	4	5	6	7	8	9	10	11	12
1-LnPayGap	1.00											
2-ExpGap	0.6273*	1.00										
3-UnexpGap	0.7788*	0.00	1.00									
4-TFP	-0.2112*	0.0793*	-0.3491*	1.00								
5-SLE	-0.1109*	0.2192*	-0.3830*	0.6890*	1.00							
6-LnAverageEmployee	-0.6437*	-0.2353*	-0.6805*	0.3467*	0.4827*	1.00						
7-LnRevenue	0.5104*	0.7955*	0.00	0.1441*	0.4057*	-0.1147*	1.00					
8-BTM	-0.1220*	-0.2095*	0.00	0.0490*	0.0463*	0.00	-0.0703*	1.00				
9-LnAge	0.1360*	0.2575*	0.00	0.0472*	0.0533*	-0.01	0.1117*	0.0590*	1.00			
10-ROA	0.1666*	0.2456*	0.00	0.1075*	0.2237*	-0.0713*	0.3704*	-0.2926*	-0.0480*	1.00		
11-Ret	0.0794*	0.1101*	0.00	0.0367*	0.0670*	-0.02	0.1059*	-0.4497*	-0.02	0.3545*	1.00	
12-STDRet	-0.3006*	-0.4466*	0.00	0.02	-0.2614*	0.0391*	-0.5832*	0.1886*	-0.1237*	-0.3583*	-0.1482*	1.00
13-Leverage	0.1995*	0.3076*	0.00	-0.1393*	0.1242*	-0.0535*	0.3242*	-0.0468*	-0.0625*	0.1128*	0.01	-0.2849*
14-IsCEOChair	-0.02	0.00	0.00	0.0368*	0.00	-0.03	-0.0414*	-0.0381*	0.0549*	0.0367*	-0.02	0.03
15-CEOTenure	-0.02	-0.04	-0.02	0.00	-0.03	-0.02	0.0980*	-0.0481*	0.2735*	0.1240*	0.03	-0.2253*
16-BoardTenure	-0.01	-0.04	0.00	0.00	-0.01	-0.02	0.1098*	-0.0556*	0.2687*	0.1188*	0.0370*	-0.2210*
17-IndCommittee	0.0774*	0.1061*	0.00	0.02	0.1088*	0.1010*	0.1910*	-0.03	0.0686*	0.0721*	0.00	-0.1925*
18-PPEIntensity	-0.2008*	-0.3430*	0.00	0.1149*	0.2859*	0.3669*	-0.2152*	0.1553*	-0.01	-0.0558*	-0.0529*	0.1377*
19-RDIntensity	-0.0697*	-0.0882*	0.00	0.01	-0.0993*	0.03	-0.0957*	-0.1420*	0.02	0.02	0.03	0.03
20-IndConcentration	0.03	0.0834*	0.00	-0.0860*	0.0335*	0.01	0.1534*	-0.1109*	0.03	-0.01	0.0350*	-0.1634*
21-Education	0.0446*	0.1347*	0.00	-0.0625*	-0.0492*	-0.01	0.01	-0.0745*	0.01	0.00	0.0447*	-0.1984*
22-Union	0.1924*	0.2767*	0.00	-0.0650*	0.0778*	-0.0643*	0.2521*	-0.0618*	-0.0625*	0.1503*	0.0401*	-0.1339*
23-Unemployment	-0.02	-0.03	0.00	0.0514*	-0.0395*	-0.0529*	-0.02	0.0950*	0.00	-0.0731*	0.03	-0.0472*
24-VacantJob	-0.03	-0.01	0.00	0.1467*	0.0466*	0.0718*	-0.1851*	0.03	0.0671*	-0.0781*	-0.0995*	0.3269*

This table presents summary statistics for the main variables in our samples. All variables are defined in Appendix A. * indicates significance at 5 per cent.

Panel B: from variable *Leverage* to *VacantJob*

	13	14	15	16	17	18	19	20	21	22	23	24
13-Leverage	1.00											
14-IsCEOChair	-0.0464*	1.00										
15-CEOTenure	0.00	0.1813*	1.00									
16-BoardTenure	-0.01	0.1833*	1.0000*	1.00								
17-IndCommittee	0.0787*	-0.0785*	-0.01	0.00	1.00							
18-PPEIntensity	0.02	0.01	-0.1055*	-0.1129*	-0.02	1.00						
19-RDIntensity	-0.0628*	0.02	0.0987*	0.0910*	0.02	-0.0696*	1.00					
20-IndConcentration	0.0496*	-0.0397*	0.0669*	0.0723*	0.0483*	-0.0803*	0.1274*	1.00				
21-Education	0.0328*	-0.0344*	0.02	0.02	-0.0469*	-0.0696*	0.0921*	0.0616*	1.00			
22-Union	0.1364*	-0.03	0.01	0.01	0.1289*	-0.02	0.01	0.1371*	-0.5516*	1.00		
23-Unemployment	0.03	-0.03	0.01	0.00	-0.0547*	-0.0604*	-0.01	-0.02	0.0498*	-0.0840*	1.00	
24-VacantJob	-0.2469*	0.0386*	-0.1198*	-0.1240*	0.0400*	0.1440*	-0.1034*	-0.1717*	-0.2776*	0.0440*	-0.3249*	1.00

This table presents summary statistics for the main variables in our samples. All variables are defined in Appendix A. * indicates significance at 5 per cent.

5.2 The determinant of pay inequality

Table 4 reports the result of implementing the model described in equation (1). These variables explain 37.6 per cent of the variation in pay inequality (adjusted r-squared of 37.6%). Consistent with our expectation, the variables are significantly related to pay inequality with the predicted signs. The regression includes the year, two-digit GICS industry, and region fixed effect. The standard errors are clustered at the firm level. All continuous variables are winsorised at the 1st and 99th percentile to minimise the impact of any potential outliers.

The result confirms that pay inequality increases (decreases) with CEO's skill and corporate governance effectiveness. Proxies for CEO's skills such as *LnRevenue*, *LnAge* and Inverse *BTM* have a significant positive relation with pay inequality. Moreover, pay inequality increases with a firm's leverage. Regarding corporate governance effectiveness, the coefficients *BoardTenure* and *IndCommittee* are negative and significant at 1% and 10%, respectively. In addition, the coefficient of *IsCEOChair* is marginally positive at 10 per cent significance.

On the other hand, the result shows that the higher employees' skill and outside opportunity leads to less pay inequality. For example, employees skill measured by *PPTIntensity* is significantly and negatively associated with pay inequality. In contrast, the unemployment rate and the percentage of vacant jobs have a significant positive relation with pay inequality by decreasing the employees bargaining power. Therefore, the model defines pay inequality appropriately. Hence, we use the predicted pay inequality to capture pay equity and the residual, the deviation from predicted pay inequality, to capture pay inequity in the next section.

Table 4 The determinant of pay inequality

		Pay inequality	
	Predicted Sign	Coefficient	Standard Error
LnRevenue	+	0.174 ***	0.025
BTM	-	-0.129 **	0.062
LnAge	+	0.245 ***	0.066
ROA	+	-0.001	0.002
Ret	+	0.011	0.059
Ret Var	+	0.455	0.859
Leverage	+/-	0.009 ***	0.002
IsCEOChair	+	0.171	0.185
BoardTenure	-	-0.038 ***	0.014
IndCommittee	-	-0.003 *	0.002
PPTIntensity	-	-0.047 ***	0.008
RDIntensity	-	-0.023	0.015
Education	-	0.073	0.1
IndConcentration	+	-0.000	0.000
Union	-	-0.009	0.038
UnemploymentRate	+	0.128 **	0.057
VacantJob	+	0.105 **	0.051
Constant		0.714	1.949
Year Fixed Effects		Yes	
Industry Fixed Effects		Yes	
Region Fixed Effects		Yes	
Firm-level clustering standard error		Yes	
Observation		2132	
Firms		385	
Adjusted R^2		0.376	

According to a two taled test,*,**,*** indicate significance at the 10%, 5% and 1% level, respectively. All variables are defined in Appendix A.

5.3 The effect of pay ratios on employee performance

Tables 5 represent the model's result in equation (2), examining the relation between pay ratios and employee performance. First, we focus on the association between pay inequality and employee performance. As it is shown, in columns (1) and (5), the coefficient is negative and highly significant (p-value less than 0.01) in both columns. Then, we examine whether there is a positive (negative) relation between pay equity (pay inequity) and employee performance. The coefficients of pay equity are not significant in both columns (columns (2) and (6)). Consistent with hypothesis H1, we find negative and significant (p-value less than 0.01) relation between pay inequity and employee performance in columns (3) and (7). To further examination, we repeat our regression by including both pay equity and pay inequity in the equation (columns (4) and (8)). The coefficient of pay inequity remains negative and highly significant (P-value =0.00). However, pay equity turns more significantly negative in columns (4) and (8).

We also control the possible effect of other factors on employee performance. As it is expected, the coefficient of *LnAveEmployeePay* and *LnRevenue* are mostly significantly positive. Regarding employee skill, *PPEIntesity* is significantly positive when we employ *SLE* as a measure of employee performance. Consistently, it presents that highly skilled employee have higher productivity. In addition, the result shows that productivity is higher in concentrated industries. One explanation is that employees increase their performance to secure their careers because there is less outside opportunity for employees in highly concentrated industries. On the other hand, the company does not want to lose their employee because there are not enough potential employees in the market. Therefore, the company also motivate their employees to exert higher productivity. Our result does not show any significant relation with other variables.

Table 5 the pay ratios and employee productivity

		TFP				SLE			
	Predicted Sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay Inequality	+/-	-0.346***				-0.305***			
		(0.0000)				(0.0000)			
Pay Equity	+		-0.295*		-0.490***		-0.101		-0.283*
			(0.0821)		(0.0032)		(0.5355)		(0.0726)
Pay Inequity	-			-0.309***	-0.345***			-0.302***	-0.323***
				(0.0000)	(0.0000)			(0.0000)	(0.0000)
LnAveEmployeePay	+	0.150**	0.471***	0.219***	0.165**	0.343***	0.616***	0.358***	0.327***
		(0.0322)	(0,0000)	(0.0041)	(0.0332)	(0,0000)	(0,0000)	(0,0000)	(0)
Education	+	-0.011	-0.067	-0.100	-0.057	0.053	-0.041	-0.057	-0.032
		(0.9101)	(0.5417)	(0.3317)	(0.5801)	(0.5899)	(0.6944)	(0.5655)	(0.7547)
PPEIntensity	+	0.001	-0.017	0.010	-0.009	0.0630***	0.0539***	0.0724***	0.0615***
		(0.8923)	(0.1942)	(0.3583)	(0.4946)	(0,0000)	(0.0002)	(0,0000)	(0.0000)
IndConcentration	-	1.357*	1.199	1.102	0.973	1.108***	1.068**	0.933*	0.857*
		(0.0704)	(0.1861)	(0.2416)	(0.2875)	(0.0033)	(0.0287)	(0.0523)	(0.0727)
Union	+/-	0.0694**	0.054	0.031	0.046	-0.017	-0.026	-0.043	-0.034
		(0.0271)	(0.14)	(0.3779)	(0.1923)	(0.5248)	(0.439)	(0.1893)	(0.2966)
CEOTenure	+	-0.002	0.001	0.006	-0.004	-0.008	-0.002	-0.002	-0.007
		(0.8632)	(0.923)	(0.6378)	(0.7262)	(0.4779)	(0.8751)	(0.9004)	(0.5863)
LnRevenue	+	0.294***	0.275***	0.234***	0.324***	0.401***	0.342***	0.333***	0.385***
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0,000)	(0,000)	(0.000)	(0.0000)
Leverage	+/-	-0.0113***	-0.00907***	-0.0127***	-0.00850***	-0.004	-0.002	-0.004	-0.002
		(0,0000)	(0.0028)	(0,0000)	(0.0042)	(0.1491)	(0.4617)	(0.1394)	(0.565)
Constant		-2.874	-4.565**	-1.892	-0.799	-0.154	-1.214	1.706	2.339
		(0.1414)	(0.0407)	(0.3911)	(0.7192)	(0.9336)	(0.5485)	(0.4186)	(0.2614)
Observation		2356	1932	1932	1932	2364	1938	1938	1938
Firms		409	368	368	368.000	409	368	368	368
Adjusted R2		0.442	0.441	0.462	0.469	0.626	0.585	0.604	0.606
Root MSE		0.813	0.815	0.799	0.794	0.751	0.771	0.753	0.751

*,**,*** indicate significance at the 10%, 5% and 1% level, respectively.
Each regression includes region, industry, and year fixed effects. Continuous variables are winsorised at 1 per cent and 99 per cent. P-values are reported in parentheses based on robust standard errors clustered at the firm level. All variables are defined in Appendix A.

Different models are applied to alleviate econometrics concerns in our primary model (shown in table 6). The first concern may be the existence of firm heterogeneity in our sample. To address this issue, we include firm fixed effects to control for time-invariant firm characteristics that may affect employee performance (reported in column FFE). The second and the most critical concern is the simultaneity problem because the compensation decision and employee performance are jointly determined. Therefore, the causality may run in both directions, from pay disparity to employee performance and vice versa. To consider this issue, we employ three additional regressions. First, we regress employee performance on the first lag of pay ratios rather than contemporaneous pay ratios. Second, we use employee performance at year t+1 rather than year.[26] Third, we estimate a regression of the changes in employee performance on the changes in pay ratios (reported in column Delta). The last concern is omitted-variable bias. To cover this problem, we include employee performance at year t-1 into our model to control omitted variables (reported in column Dynamic). However, note that this method causes autocorrelation and endogeneity problems.

The appropriate method to control the endogeneity problem arising from reverse causality or a systematic measurement error on the explanatory variables is to use instrumental variables that are not subject to reverse causality for the variable of primary interest, pay ratios. Therefore, we address the endogeneity problem as best as we can using the SGMM. The SGMM estimator also controls unobserved heterogeneity and dynamics in the system by using a lagged dependent variable. SGMM contains both level equation and first differences equation that are jointly estimated as a system. For the level equation, lagged first differences of pay ratios and firm-level ratios are used as instruments in our estimation. The level equation also uses the first lagged of employee compensation, CEO tenure and industry-level and region-level ratios as their instrument. Alternatively, the first differences equation employs the second lagged pay ratios and firm-level ratios as instruments. It also uses the second lagged of first differences of other regressors as their instrument. The first-order autocorrelation, second-order autocorrelation, Hansen test of over-identification, and difference-in-Hansen tests of exogeneity of instruments are also reported. The SGMM estimates are most reliable, and our conclusions are based on this.

[26] We do not tabulate the regression result of employee performance on the first lag of pay ratios and also employee performance at year t+1 on all at year t to conserve space but they are available upon request.

Table 6: Pay ratios and employees performance

Panel A: The pay inequality and employee performance

	Total factor productivity (TFP)				Ln (revenue per employee) (SLE)			
	FFE	Delta	Dynamic	SGMM	FFE	Delta	Dynamic	SGMM
Lag.TFP			0.751***	0.549***				
			(0.000)	(0.000)				
Lag.SLE							0.631***	0.531***
							(0.000)	(0.000)
Pay Inequality	-0.181***		-0.111***	-0.181**	-0.144***		-0.146***	-0.224**
	(0.000)		(0.0001)	(0.0417)	(0.000)		(0.000)	(0.0121)
Lag.Pay Inequality								
Changes. Pay Inequality		-0.166***				-0.256***		
		(0.000)				(0.000)		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	2356	1924	2059	1841	2364	1935	2074	1853
Firms	409	361	376	348	409	362	379	350
Adjusted R2	0.353	0.076	0.807	-	0.717	0.101	0.832	-
Root MSE	0.403	0.487	0.471	-	0.300	0.535	0.494	-
Number of Ins				187				187
Arellano-Bond test for AR(1)				0.000				0.000
Arellano-Bond test for AR(2)				0.433				0.543
Hansen test of over-identification				0.246				0.437
Difference-in-Hansen tests of exogeneity				0.501				0.304

Panel B: The pay inequity and employee productivity

	Total factor productivity (TFP)				Ln (revenue per employee) (SLE)			
	FFE	Delta	Dynamic	SGMM	FFE	Delta	Dynamic	SGMM
Lag.TFP			0.752***	0.613***				
			(0.000)	(0.000)				
Lag.SLE							0.651***	0.602***
							(0.000)	(0.000)
Pay Inequity	-0.122***		-0.0958***	-0.134*	-0.111***		-0.136***	-0.176**
	(0.0016)		(0.0003)	(0.0964)	(0.0001)		(0.000)	(0.0294)
Lag.Pay Inequity								
Changes. Pay Inequity		-0.211***				-0.307***		
		(0.000)				(0.000)		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	1932	1491	1733	1577	1938	1499	1743	1585
Firms	368	305	342	317	368	307	344	318
Adjusted R2	0.369	0.106	0.816	-	0.706	0.145	0.834	-
Root MSE	0.380	0.433	0.459	-	0.282	0.463	0.481	-
Number of Ins				179				183
Arellano-Bond test for AR(1)				0.000				0.000
Arellano-Bond test for AR(2)				0.504				0.928
Hansen test of over-identification				0.616				0.380
Difference-in-Hansen tests of exogeneity				0.710				0.551

Table 6 (continued)

Panel C: the pay equity and employee productivity

	FFE	Delta	Dynamic	SGMM	FFE	Delta	Dynamic	SGMM
Lag.TFP			0.760***	0.727***				
			(0.000)	(0.000)				
Lag.SLE							0.664***	0.592***
							(0.000)	(0.000)
Pay equity	-0.339*		-0.173***	-0.690***	0.029		-0.131	-0.389
	(0.0643)		(0.0081)	(0.0085)	(0.8284)		(0.1013)	(0.1477)
Lag.Pay equity								
Changes.Pay equity		0.408**				0.431*		
		(0.0125)				(0.0683)		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	1932	1491	1733	1577	1938	1499	1743	1585
Firms	368	305	342	317	368	307	344	318
Adjusted R2	0.365	0.057	0.815	-	0.701	0.040	0.831	-
Root MSE	0.382	0.444	0.461	-	0.285	0.490	0.486	-
Number of Ins				183				183
Arellano-Bond test for AR(1)				0.000				0.000
Arellano-Bond test for AR(2)				0.631				0.930
Hansen test of over-identification				0.395				0.622
Difference-in-Hansen tests of exogeneity				0.431				0.742

Panel D: the pay inequity and pay equity and employee productivity

	FFE	Delta	Dynamic	SGMM	FFE	Delta	Dynamic	SGMM
Lag.TFP			0.748***	0.611***				
			(0.0000)	(0.0000)				
Lag.SLE							0.649***	0.576***
							(0.0000)	(0.0000)
Pay equity	-0.442**		-0.244***	-0.555***	-0.053		-0.222***	-0.472*
	(0.0155)		(0.0005)	(0.0096)	(0.6872)		(0.0081)	(0.0724)
PayInequity	-0.144***		-0.117***	-0.180**	-0.114***		-0.154***	-0.227***
	(0.0002)		(0,000)	(0.0188)	(0.0000)		(0.0000)	(0.0021)
Lag.Pay equity								
Lag.PayInequity								
Changes.Pay equity		0.273*				0.232		
		(0.0827)				(0.3237)		
Changes.PayInequity		-0.197***				-0.294***		
		(0.0000)				(0.0000)		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	1932	1491	1733	1577	1938	1499	1743	1585
Firms	368	305	342		368	307	344	
Adjusted R2	0.376	0.114	0.818		0.706	0.150	0.835	
Root MSE	0.378	0.431	0.457		0.282	0.461	0.479	
Number of Ins				203				207
Arellano-Bond test for AR(1)				0.000				0.000
Arellano-Bond test for AR(2)				0.552				1.000
Hansen test of over-identification				0.580				0.577
Difference-in-Hansen tests of exogeneity				0.475				0.819

*,**,*** indicate significance at the 10%, 5% and 1% level, respectively.

The regression in all but FFE column includes region, industry, and year fixed effects. The regression in the FFE column includes firm fixed effect and year fixed effects. In column Delta we regress the changes in TFP or SLE on changes in pat ratios. In column Dynamic we add the lag of TFP or SLE into our model. In the SGMM column the result of SGMM estimation is reported. Continuous variables are winsorised at 1 per cent and 99 per cent. P-values are reported in parentheses based on robust standard errors clustered at the firm level. All variables are defined in Appendix A.

Table 6 panel A confirms our prior result in columns (1) and (4) of table 5. It demonstrates that the increasing pay inequality is perceived as unfair income distribution, leading to a negative effect on employees' performance. However, our result contrasts with Faleye et al.(2013)'s result, with no significant relationship between pay inequality and employee performance in the U.S. One explanation can be the difference in calculating average employee pay. Faleye et al.(2013) measure the average employee pay as total labour expenses less total executives compensation divided by the number of employees. Whereas, we calculate it as total employees expenses less total CEO pay divided by the number of employees minus one[27]. The second explanation can be the difference in the context of the experiment. Equity and Relative Deprivation theories assert that the impact of pay inequality can be different in various samples, in which employees have different norms or values.[28] Australia is one of the wealthiest countries globally [29] , and it is widely regarded as an egalitarian country where the principle of a "Fair Go" is strongly supported by the community and all political parties (Saunders and Wong n.d.). The labour party is Australia's oldest political party, established federally in 1901. Australian political leaders continue to stress the importance of the "Fair Go" in defining what Australia stands for as a nation. Moreover, several studies (e.g., Chesters, 2010; Meagher & Wilson, n.d.) examined Australian attitudes towards income inequality and found that most Australians believe that the income inequality between the lowest and upper-income levels is significant. Therefore, it would be anticipated that the sociological perspective is more dominated in Australia.

Table 6 panel B illustrates further evidence of the negative and significant relation between pay inequity and employee performance, consistent with our hypothesis. It means that employees negatively (positively) react to the pay inequity, which is higher (lower) than the reasonable pay inequality. It shows that employees respond differently to pay inequity, which is in their favour rather than those that are not. To clarify, employees perceive the negative pay inequity as the favourable pay inequality because the pay inequality is less than its reasonable amount. So, the

[27] We employ the different method because the lack of executives compensation and the number of executives information in TRD and Datanalysis.

[28] These theories discuss that social dictates can affect what society tells individuals, what they are entitled to and what they find desirable.

[29] Global wealth report 2019, Research institute, October 2019

negative coefficient of pay inequity illustrates that moving from favourable pay inequality to reasonable pay inequality decreases employees performance. In contrast, positive pay inequity is interpreted as unfavourable pay inequality since the pay inequality is more than its reasonable amount. In this situation, Increasing pay inequity from zero to a positive amount leads to less employee performance. Hence, employees have higher performance in the presence of favourable pay inequity rather than unfavourable pay inequity.

Table 6 panel C shows mixed results about the association between pay equity and employee performance. Regarding TFP as a proxy of employee performance, the coefficient of pay equity is either highly significantly negative (Lag, Lead, Dynamic, SGMM) or highly significantly positive (Delta). By focusing on *SLE* as a measure of employee performance, we cannot find a significant impact of pay equity on employee performance in the system GMM model. Therefore, the impact of pay equity on employee performance is ambiguous. In addition, Table 6 panel D shows the further examination of our regression when both pay equity and pay inequity are included. In all columns, there is a negative and significant relation between PayInequity and employee performance. However, the relation between Pay equity and employee performance remains unclear.

5.4 Examining a non-linear relation between pay equity and employee performance

In the previous section, we examine the linear relation between pay ratios and employee performance. The analysis illustrates that pay inequality and pay inequity negatively affect employee performance, while the result for pay equity is unclear. As discussed under hypothesis 2, this section investigates whether pay equity follows a non-linear relation with employee performance based on Tournament Theory or not. Table 7 shows that the coefficient estimates on pay equity^2 and pay equity are significantly negative and positive. This result presents an inverse U-shaped relation between pay equity and employee performance. The finding does not change in the system GMM model[30]. However, the amount of a turning point slightly decreases. This result supports the view that a non-linear relationship between *Pay equity* and employee performance

[30] Like previous analysis, we also regress employee performance on the lag of our independent variables, employee performance at year t+1 on all regressors at time t. our result remain similar and significant.

exist, and there is an optimum level of pay equity. Therefore, a pay equity level that is too high or too low is sub-optimal in terms of employee productivity. This result suggests that a reward system that is linked to individuals' inputs can increase employees' performance. However, the curvilinearity relation indicates that increasing pay equity higher than the turning point may lead to lower employee productivity. Hence, considering the current level of pay equity in their company before deciding to increase it is essential for managers.

Furthermore, we examine the non-linear relation between two other pay ratios (pay inequality and pay inequity) and employee performance[31]. Our result does not show the non-linear association between these two ratios and employees performance. Regarding our estimation on pay inequality, the coefficient on pay inequality is significantly negative, and the coefficient on the square term of pay inequality is significantly positive. However, its turning point (minimum point) exceeds the maximum pay inequality in our sample. Similar to our analysis on pay inequality, the coefficient on pay inequity is significantly negative, and the coefficient on the square term of pay inequity is significantly positive. Nevertheless, we find that there is an extreme turning point in the 95 percentile. Hence, our analysis shows an inverse U-shaped relation between Pay equity and employee performance and the linear negative relation between other ratios, pay inequality and pay inequity, and employee performance.

[31] In results not reported here, but available on request

Table 7 the non-linear relation between ay equity and employee productivity

	TFP				SLE			
	Primary1	SGMM1	Primary2	SGMM2	Primary3	SGMM3	Primary4	SGMM4
Lag.TFP		0.647***		0.650***				
		(0.000)		(0.0000)				
Lag.SLE						0.536***		0.539***
						(0.000)		(0.0000)
Pay equity	2.207***	1.037**	1.775***	0.820**	2.887***	1.078**	2.513***	0.749**
	(0.000)	(0.0499)	(0.0002)	(0.0418)	(0.000)	(0.0122)	(0.0000)	(0.0330)
Pay equity^2	-0.400***	-0.246***	-0.357***	-0.210***	-0.480***	-0.214***	-0.442***	-0.188***
	(0.000)	(0.001)	(0.0000)	(0.0012)	(0.000)	(0.0001)	(0.0000)	(0.0002)
Pay inequity			-0.288***	-0.107			-0.250***	-0.187**
			(0.0000)	(0.1371)			(0.0000)	(0.0100)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	1932	1577	1932	1351	1938	1585	1938	1355
Firms	368	317	368	281	368	318	368	283
Adjusted R2	0.482	-	0.501	-	0.636	-	0.648	-
Root MSE	0.784	-	0.770	-	0.722	-	0.710	-
Number of Ins		207		231		207		231
Arellano-Bond test for AR(1)		0		0.000		0		0
Arellano-Bond test for AR(2)		0.529		0.548		0.97		0.996
Hansen test of over identification		0.424		0.689		0.792		0.775
Difference-in-Hansen tests of exogeneity		0.501		0.798		0.895		0.935
Turning Point	2.7560	2.1047	2.484	1.9513	3.0086	2.5223	2.840	1.9888
Percentile that the turning point belongs	33	-	20	-	47	-	38	-
Lower-bond slope	2.2125	1.0407	1.7800	0.8230	2.8931	1.0808	2.5186	0.7513
Lowerbond p-value	0.0000	0.0248	0.000	0.208	0.0000	0.0061	0.000	0.164
Upperbond slope	-2.0214	-1.5651	-1.998	-1.3993	-2.1793	-1.1785	-2.15846	-1.2392
upprbond p-value	0.0000	0.0000	0.000	0.000	0.0000	0.0000	0.000	0.000
P-value /utest	0.0000	0.0248	0.0001	0.028	0.0000	0.0061	0.000	0.0164

*,**,*** indicate significance at the 10%, 5% and 1% level, respectively.
All regressions includes region, industry, and year fixed effects. In the SGMM column the result of SGMM estimation is reported. Continuous variables are winsorised at 1 per cent and 99 per cent. P-values are reported in parentheses based on robust standard errors clustered at the firm level. All variables are defined in Appendix A.

6 Limitation and future study direction

Although our result provides relatively strong support for our hypotheses, it should be viewed in light of its potential limitations. First, we assume that employees are aware of CEO compensation and CEO's pay is a reference to evaluate their compensation. Although we do not directly test this assumption, the regulators and business press focus on executive compensation, experimental studies on CEO pay ratio, and the strength of our findings illustrate the reasonability of this assumption. A related limitation is that our study is limited to vertical pay disparity. However, individuals compare their compensation with various referents in the same level (horizontal pay disparity) and upper level (vertical pay disparity). Therefore, our model can be generalised to horizontal pay disparity in an organisation. Moreover, a future avenue for research would be comparing the impact of different types of pay disparity and investigating the overall effect of vertical and horizontal pay disparity on employee performance. Second, sociological theories depend on the individuals' perception of input and outcomes, which will lead to their reaction (Gupta et al. 2012). However, we do not assess employees' perceived inputs and outcomes in this study. By following Adams (1963), we also assume that employees consider their effort as input and monetary reward as an outcome. Therefore, future research might explore how other perceived outcomes (e.g., high quality of working environment) moderate the effect of compensation disparity on their performance.

A further limitation of our study is the lack of publicly available data. Therefore, our model for measuring pay equity and pay inequity will rarely be known with complete certainty. Our measure of pay inequity probably will, to at least some degree, be associated with compensation based on rational or logical pay elements that we are not acknowledged to detect. Even determining what inputs are precisely relevant to the outcome in principle and not is subjective. Despite this limitation, consistent results to previous research support our conceptual and empirical modelling of pay equity and inequity. A related limitation is that our result is based on Australian listed firms where there is a strong emphasis on egalitarianism. While the theories support our empirical design in general, our findings may not hold in a cross-cultural setting with varying degrees of pay disparity and inequity aversion. Therefore, another avenue for future research would be to investigate whether cultural views on compensation influence this relationship.

A final limitation is that we assume all employees in different working places react homogenously to pay disparity. This question remains that whether individuals with different characteristics in various jobs and different working environments have the same reaction to pay equity and pay inequity. Hence, developing appropriate conceptual models for investigating this question will be another future research area. Considering these limitations, we suggest our study does provide new insight into the accumulating research on pay dispersion and supports the notion that such research is vital for understanding how to design compensation systems properly.

7 Conclusion

Using a dataset of Australian listed companies, we have studied how within-firm pay inequality between CEO and employee relates to employee performance and whether or not breaking down pay inequality into pay equity and pay inequity can provide an appropriate ground for integrating sociological and economic perspectives. We find that higher pay inequality is significantly associated with lower employee productivity. It illustrates that the sociological perspective is more dominant in our sample. In order to separate pay inequality from pay equity, we estimate pay inequality according to CEO and employees' input, company characteristics and macroeconomic factors. Consistent with our expectations, we find that pay inequality is positively related to CEO's skill but and negatively associated with employees' input and outside opportunities, as well as corporate governance effectiveness. In addition, we find that pay inequity, which is an unexplained part of pay inequality, is negatively related to employee performance, consistent with the sociological perspective. However, the relation between pay equity and employee performance is not clear. We examine the possibility of a non-linear pay equity impact. Our result suggests that, at least in our sample, at a higher level of pay equity, increases pay equity diminish employee performance. In fact, we find a hump-shaped relationship between pay equity and employee performance.

Our findings extend the previous integrated approach to the relation between vertical pay disparity and individual performance in an organisation setting. In general, our results suggest that employees have higher performance in the small level of pay inequity and a large amount of pay equity. However, we should be aware that increasing pay equity greater than a specific threshold will decrease employee performance. In addition, our findings have managerial implications for the design of compensation between hierarchical levels. We believe that the pay system based on

individuals' input into the workplace can effectively motivate employees and increase their performance. However, employees should be aware and convinced about the accuracy of the award system. Managers should consider the current level of pay equity in their company before deciding to increase pay equity. Our non-linear analyses indicate that more pay equity may collect few or no organisation-level advantages for companies that already have high pay equity. Our finding has implications for regulators as well. It suggests that CEO pay ratio disclosure per se without putting them into equity context will lead to misinterpretation. Without detailed knowledge of employees and CEO input, financial statement users may interpret the CEO pay ratio with insufficient information. We believe disclosure of relevant information about workforces can help financial statement users more accurately judge the effect of pay structure on performance

Appendix A: Definition of Variables

Variable	Definition	Source
Pay Ratio:		
PayInequality	The natural logarithm of (CEO Compensation / average employee compensation)	
Pay equity	Predicted pay inequality by CEO and employees by equation (1)	
PayInequity	The residual of equation (1) shows the deviation from pay equity	
CEO compensation	CEO compensation is their total compensation, including short-term pay (e.g. salary and fees, accrued bonus), post-employment (e.g., superannuation) and share-based payment right.	Datastream
LnAveEmployeePay	The natural logarithm of Employee benefits (Wage and salaries, superannuation, share-based payment) minus CEO compensation divided by the number of employees minus one	
CEO's Barganing Power:		
LnRevenue	The natural log of total sales in a million dollars,	Datastream
BTM	Book value of equity /(share price * total shares outstanding)	Datastream
LnAge	Natural log of (current fiscal date – listing date) in year	
Ret	Log (return during the fiscal year)	Datastream
ROA	(Net Income + (Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate)) / Average of Last Year's and Current Year's Total Assets * 100	Datastream
STDRet	Rolling 60-month standard deviation of returns,[32]	
STDROA	Rolling 5 years standard deviation of returns,[33]	
Leverage	Total long-term debt scaled by the total asset	Datastream
BoardSize	The total number of board members at the end of the fiscal year	Datastream
IsCEOBoard	An indicator equal to 1 if the CEO is a board member and 0 otherwise	Datastream
IsCEOChair	An indicator equal to 1 if the CEO is the chairman of the board and 0 otherwise	Datastream
BoardTenure	The average number of years that each board member has been on the board.	Datastream
IndCommittee	Percentage of independent board members on the compensation committee as stipulated by the company	Datastream

[32] I calculate it if at least the data is available for 36 months.

[33] I calculate it if at least the data is available for 36 months.

Employee Bargaining Power:		
RDIntensity	Research and development expenses scaled by total asset, assumed equal to zero when R&D is missing in Datastream.	Datastream
PPTIntensity	Net property, plant and equipment per employee in millions dollars.	Datastream
Education	The percentage of population with at least bachelor degree in each region in each year.	
IndConcentration	The sales-based Herfindahl index calculated based on all datastream firms in the same industry. Revenue is winsorised at the 5 and 95th percentiles.	
Union	The percentage of employee who are a member of trade union degree in each region in each year.	ASB
UnemploymentRate	The percentage of those looking for job to labour force in each region in each year .	ASB
VacantJob	The ratio of vacant jobs to total jobs in each industry in each year.	ASB

Appendix B: Industry map to join GICS to ANZSIC

GICS IndustryGroup (two-digit)	ANZSIC code
Materials	Mining (B)
Energy	Oil & gas extraction (07)
Real Estate	Property operators & real estate services (67)
Software & Services	Computer system design & related services (70)
Capital Goods	Construction (E)
Diversified Financials	Finance (62)
Retailing	Retail trade (G)
Consumer Services	Accommodation and food services (H)
Commercial & Professional Services	Professional, scientific & technical services (except computer design) (69)
Health Care Equipment & Services	Health care and social assistance (Q)
Food, Beverage & Tobacco	Food product manufacturing (11)
Media & Entertainment	Information media and telecommunications (J)
Pharmaceuticals, Biotechnology & Life Sciences	Basic chemical & chemical product manufacturing (18)
Utilities	Electricity, gas, water and waste services (D)
Transportation	Transport, postal and warehousing (I)
Banks	Finance (62)
Insurance	Insurance & superannuation funds (63)
Telecommunication Services	Telecommunications services (58)
Food & Staples Retailing	Food retailing (41)
Household & Personal Products	Other services (S)
Technology Hardware & Equipment	Information media and telecommunications (J)
Consumer Durables & Apparel	Textile, leather, clothing & footwear manufacturing (13)
Semiconductors & Semiconductor Equipment	Other services (S)
Automobiles & Components	Other services (S)

References

Adams, J. S. 1963. “Towards an Understanding of Inequity.” *Journal of Abnormal and Social Psychology* 67(5):422–36.

Adams, J. S. 1965. “Inequity in Social Exchange.” *In Advances in Experimental Social Psychology* 2:267–99.

Akerlof, George A., and Janet L. Yellen. 1990. “The Fair Wage-Effort Hypothesis and Unemployment.” *The Quarterly Journal of Economics* 105(2):255–83.

Arellano, Manuel, and Stephen Bond. 1991. “Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations.” *The Review of Economic Studies* 58(2):277–97.

Arellano, Manuel, and Olympia Bover. 1995. “Another Look at the Instrumental Variable Estimation of Error-Components Models.” *Journal of Econometrics* 68(1):29–51.

Baker, David, and Richard Denniss. 2010. “Reining It in Executive Pay in Australia.” (9):1–23.

Banker, Rajiv D., Danlu Bu, and Mihir N. Mehta. 2016. “Pay Gap and Performance in China.” *Abacus* 52(3):501–31.

Barro, Robert J. 2001. *Human Capital and Growth*.

Bebchuk, Lucian A., K. J. Martij. Cremers, and Urs C. Peyer. 2011. “The CEO Pay Slice.” *Journal of Financial Economics* 102(1):199–221.

Berk, Jonathan B., Richard Stanton, and Josef Zechner. 2010. “Human Capital, Bankruptcy, and Capital Structure.” *The Journal of Finance* 65(3):891–926.

Bloom, Matt, and John G. Michel. 2002. “The Relationships Among Organisational Context, Pay Dispersion, and Among Managerial Turnover.” *Academy of Management Journal* 45(1):33–42.

Brown, Mark P., Michael C. Sturman, and Marcia J. Simmering. 2003. “Compensation Policy and Organisational Performance: The Efficiency, Operational, and Financial Implications of Pay Levels and Pay Structure.” *Academy of Management Journal* 46(6):752–62.

Chemmanur, Thomas J., Yingmei Cheng, and Tianming Zhang. 2013. “Human Capital, Capital Structure, and Employee Pay: An Empirical Analysis.” *Journal of Financial Economics* 110(2):478–502.

Chen, C., and T. Sandino. 2012. “Can Wages Buy Honesty? The Relationship Between Relative Wages and Employee Theft.” *Journal of Accounting Research* 50(4):967–1000.

Chen, Zhihong, Yuan Huang, and John Wei. 2013. *Executive Pay Disparity and the Cost of Equity Capital*. Vol. 48.

Chesters, Jenny. 2010. *Evidence and Perceptions of Inequality in Australia*.

Connelly, Brian L., Katalin Takacs Haynes, Laszlo Tihanyi, Daniel L. Gamache, and Cynthia E. Devers. 2016. “Minding the Gap: Antecedents and Consequences of Top Management-To-Worker Pay Dispersion.” *Journal of Management* 42(4):862–85.

Connelly, Brian L., Laszlo Tihanyi, T. Russell Crook, and K. Ashley Gangloff. 2014. “Tournament Theory.” *Journal of Management* 40(1):16–47.

Conroy, S. A., N. Gupta, J. D. Shaw, and T. Y. Park. 2014. “A Multilevel Approach to the Effects of Pay Variation.” *Research in Personnel and Human Resources Management*.

Core, John E., Robert W. Holthausen, and David F. Larcker. 1999. “Corporate Governance, Chief Executive Officer Compensation, and Firm Performance.” *Journal of Financial Economics* 51(3):371–406.

Corneliben, T., O. Himmler, and T. Koenig. 2011. “Perceived Unfairness in CEO Compensation and Work Morale.” *Economics Letters* 110(1):45–48.

Cowherd, Douglas M., and David I. Levine. 1992. “Product Quality and Pay Equity Between Lower-Level Employees and Top Management: An Investigation of Distributive Justice Theory.” *Administrative Science Quarterly* 302–20.

Cronqvist, Henrik, Fredrik Heyman, Mattias Nilsson, Helena Svaleryd, and Jonas Vlachos. 2009. “Do Entrenched Managers Pay Their Workers More?” *The Journal of Finance* 64(1):309–39.

Crosby, Faye. 1984. “Relative Deprivation in Organisational Settings.” *Research in Organisational Behavior*.

Dai, Yunhao, Dongmin Kong, and Jin Xu. 2017. “Does Fairness Breed Efficiency? Pay Gap and Firm Productivity in China.” *International Review of Economics and Finance* 48:406–22.

DeVaro, Jed. 2006. “Strategic Promotion Tournaments and Worker Performance.” *Strategic Management Journal* 27(8):721–40.

Ehrenberg, Ronald G., and Michael L. Bognanno. 1990. “Do Tournaments Have Incentive Effects?” *Journal of Political Economy* 98(6):1307–24.

Faleye, Olubunmi, Rani Hoitash, and Udi Hoitash. 2011. “The Costs of Intense Board Monitoring.” *Journal of Financial Economics* 101(1):160–81.

Faleye, Olubunmi, Vikas Mehrotra, and Randall Morck. 2006. “When Labor Has a Voice in Corporate Governance.” *Journal of Financial and Quantitative Analysis* 41(3):489–510.

Faleye, Olubunmi, Ebru Reis, and Anand Venkateswaran. 2013. “The Determinants and Effects of CEO-Employee Pay Ratios.” *Journal of Banking and Finance* 37(8):3258–72.

Gerhart, Barry, and Sara Rynes. 2003. *Compensation: Theory, Evidence, and Strategic Implications*. SAGE publications.

Grund, Christian, and Niels Westergaard-Nielsen. 2008. “The Dispersion of Employees’ Wage Increases and Firm Performance.” *ILR Review* 61(4):485–501.

Gupta, Nina, Samantha A. Conroy, and John E. Delery. 2012. “The Many Faces of Pay Variation.” *Human Resource Management Review* 22(2):100–115.

Heyman, Fredrik. 2005. “Pay Inequality and Firm Performance: Evidence from Matched Employer–Employee Data.” *Applied Economics* 37(11):1313–27.

Homans, GC. 1974. “Social Behavior: Its Elementary Forms.”

Jia, Liangding, Jason D. Shaw, Anne S. Tsui, and Tae Youn Park. 2014. “A Social-Structural Perspective on Employee-Organization Relationships and Team Creativity.” *Academy of Management Journal* 57(3):869–91.

Kale, J. R., E. Reis, and A. Venkateswaran. 2009. “Rank-Order Tournaments and Incentive Alignment: The Effect on Firm Performance.” *The Journal of Finance* 64(3):1479–1512.

Kepes, S., J. Delery, and N. Gupta. 2009. “Contingencies in the Effects of Pay Range on Organizational Effectiveness.” *Personnel Psychology* 62(3):497–531.

Kulik, Carol T., and Maureen L. Ambrose. 1992. “Personal and Situational Determinants of Referent Choice.” *Academy of Management Review* 17(2):212–37.

Lallemand, Thierry, Robert Plasman, and Francois Rycx. 2004. “Intra-Firm Wage Dispersion and Firm Performance: Evidence from Linked Employer-Employee Data.” *Kyklos* 57(4):533–58.

Lawler, E. 1981. “Pay and Organization Development Reading.” *MA: Addison-Wesley*.

Lazear, Edward., and Sherwin Rosen. 1981. “Rank-Order Tournaments as Optimum Labor Contracts.” *Journal of Political Economy* 89(5):841–64.

Lee, Kin Wai, Baruch Lev, and Gillian Hian Heng Yeo. 2008. “Executive Pay Dispersion, Corporate Governance, and Firm Performance.” *Review of Quantitative Finance and Accounting* 30(3):315–38.

Levine, David I. 1991. “Cohesiveness, Productivity, and Wage Dispersion.” *Journal of Economic Behavior and Organization* 15(2):237–55.

Mahy, Benoît, François Rycx, and Mélanie Volral. 2011. “Wage Dispersion and Firm Productivity in Different Working Environments.” *British Journal of Industrial Relations* 49(3):460–85.

Mahy, Benoît, François Rycx, and Mélanie Volral. 2016. “Are Workers Less Absent When Wage Dispersion Is Small?” *International Journal of Manpower* 37(2):197–209.

Martin, J., and J. Murnighan. 1981. “Relative Deprivation: A Theory of Distributive Injustice and Organizational Illegitmacy.” *Social Psychology in Organisations: Advances in Theory and Research* 296–321.

Meagher, Gabrielle, and Shaun Wilson. n.d. “RICHER, BUT MORE UNEQUAL: PERCEPTIONS OF INEQUALITY IN AUSTRALIA 1987-2005.”

Messersmith, Jake G., James P. Guthrie, Yong Yeon Ji, and Jeong Yeon Lee. 2011. “Executive Turnover: The Influence of Dispersion and Other Pay System Characteristics.” *Journal of Applied Psychology* 96(3):457–69.

Mueller, HM, PP Ouimet, and E. Simintzi. 2017. “Within-Firm Pay Inequality.” *The Review of Financial Studies* 30(10):3605–35.

O’Reilly, Charles A., James Wade, Brian G. M. Main, Charles A., James Wade, Charles A. O’Reilly, and James Wade. 1993. “Top Executive Pay: Tournament or Teamwork?” *Journal of Labor Economics* 11(4):606–28.

Pfeffer, Jeffrey. 2007. “Human Resources from an Organisational Behavior Perspective: Some Paradoxes Explained.” *Journal of Economic Perspectives* 21(4):115–34.

Productivity Commission. 2009. *Executive Remuneration in Australia: Productivity Commission Inquiry Report*.

Richardson, David. 2018. “Executive Pay in Australia .” *The Australia Institute Research That Matter*. Retrieved June 1, 2021 (https://australiainstitute.org.au/report/executive-pay-in-australia/).

Ridge, Jason W., Federico Aime, and Margaret A. White. 2015. “When Much More of a Difference Makes a Difference: Social Comparison and Tournaments in the CEO’s Top Team.” *Strategic Management Journal* 36(4):618–36.

Rouen, Ethan. 2020. “Rethinking Measurement of Pay Disparity and Its Relation to Firm Performance.” *Accounting Review* 95(1):343–78.

Saunders, Peter, and Melissa Wong. n.d. “EXAMINING AUSTRALIAN ATTITUDES TO INEQUALITY AND REDISTRIBUTION.”

Shaw, J. D., and N. Gupta. 2007. “Pay System Characteristics and Quit Patterns of Good, Average, and Poor Performers.” *Personnel Psychology* 60(4):903–28.

Shaw, Jason D., Nina Gupta, and John E. Delery. 2002. “Pay Dispersion and Workforce Performance: Moderating Effects of Incentives and Interdependence.” *Strategic Management Journal* 23(6):491–512.

Shin, Jae Yong, Sung-Choon Kang, Jeong-Hoon Hyun, and Bum-Joon Kim. 2015. “Determinants and Performance Effects of Executive Pay Multiples.” *ILR Review* 68(1):53–78.

Toner, Phillip. 2011. “Workforce Skills and Innovation: An Overview of Major Themes in the Literature.” 1.

Trevor, Charlie O., Greg Reilly, and Barry Gerhart. 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, James B., Charles A. O’Reilly, and Timothy G. Pollock. 2006. “Overpaid CEOs and Underpaid Managers: Fairness and Executive Compensation.” *Organization Science* 17(5):527–44.

Walster, E., E. Berscheid, and G. W. Walster. 1973. “New Directions in Equity Research.” *Journal of Personality and Social Psychology* 25(2).

Winter-Ebmer, Rudolf, and Josef Zweimüller. 1999. “Intra-Firm Wage Dispersion and Firm Performance.” *Kyklos* 52(4):555–72.

Yermack, David. 1996. *Higher Market Valuation of Companies with a Small Board of Directors*. Vol. 40.