“Pay disparity, investment in internal control personnel, and a firm’s investment inefficiency: Korean evidence”

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PAY DISPARITY, INVESTMENT IN INTERNAL CONTROL PERSONNEL, AND A FIRM'S INVESTMENT INEFFICIENCY: KOREAN EVIDENCE

Abstract

The purpose of this study is to investigate the relationship between pay disparity and a company's investment inefficiency, and to explore the moderating influence of investment in internal control personnel on this relationship. The global concern over pay disparity has intensified as executive compensation soars to unparalleled heights, while employee wages remain static. Utilizing a fixed-effect regression model and analyzing 5,407 observations from Korean listed companies between 2018 and 2020, the study shows a positive association between pay disparity (coef = 0.034, p-value < 0.01) and investment inefficiency, with pay disparity increasing the level of investment inefficiency by fostering overinvestment. Furthermore, the study shows that the interaction term between pay disparity and quantitative (coef = –0.246, p-value < 0.01) and qualitative (coef = –2.104, p-value < 0.01) investments in internal control personnel is negative and significant, indicating that the positive link between pay disparity and investment inefficiency is lessened when there is a higher quantitative and qualitative investment in internal control personnel. By offering a more comprehensive understanding of the conflicting evidence about the impact of pay disparity and the role of investment in internal control personnel in moderating the negative effect of pay disparity on investment efficiency, this study contributes to the existing literature. The findings of the study suggest that companies aiming to minimize investment inefficiency should consider not only addressing pay disparity but also investing in internal control personnel.

Keywords pay disparity, investment efficiency, inefficient investment, overinvestment, internal control, internal control personnel, human resource investment

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INTRODUCTION

The issue of pay disparity between executives and workers has gained increasing attention in numerous countries worldwide, as executive compensation packages have surged to unprecedented levels, while worker pay has remained stagnant. In large public companies, the pay gap between executives and rank-and-file employees has expanded over eight times in recent decades (AFL-CIO, 2014). This phenomenon, commonly referred to as pay disparity, has become a pressing concern for the public due to income polarization. Consequently, academics and regulators across the globe have focused their attention on this topic. In the United States, the Securities and Exchange Commission (SEC) addressed these concerns by introducing rules in 2015, requiring listed firms to disclose their CEO's total annual compensation ratio to median employee pay for fiscal years commencing on or after January 1, 2017.

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This growing pay disparity has spurred significant research, examining both executive-to-worker and intra-firm pay disparities (e.g., Eriksson, 1999; Faleye et al., 2013; Shin et al., 2015). Existing research on pay disparity primarily investigates its economic consequences, including firm value, productivity, and performance. However, prior studies present inconclusive evidence, which varies based on differing perspectives. Two predominant views on pay disparity effects exist: the tournament incentive view and the rent extraction view. The former posits a positive impact on firm performance, value, and productivity (Kale et al., 2009), while the latter argues that pay disparity adversely affects firm performance and value (Bebchuk et al., 2011). Although some studies support the positive aspect of pay disparity from the tournament incentive perspective, the majority of existing research aligns with the rent extraction view, emphasizing concerns about managerial opportunism and highlighting the negative consequences of significant pay disparity. The inconclusive nature of previous research necessitates further exploration to better understand pay disparity's effects on firm operations and performance.

In the realm of corporate finance and accounting literature, corporate investment efficiency has consistently been a focal area of research, owing to its significant effect on both firm value and performance (Bae et al., 2022; Chen et al., 2021). Recognizing investment efficiency's critical importance, numerous studies have explored the determinants influencing a firm's investment efficiency (Choi et al., 2021; McNichols & Stubben, 2008). Despite the considerable attention paid to examining investment efficiency and pay disparity separately, a conspicuous gap in research exists regarding the effect of pay disparity on a firm's investment efficiency.

1. LITERATURE REVIEW AND HYPOTHESES

Existing literature on the economic consequences of pay disparity primarily revolves around two theoretical frameworks: the tournament perspective and the rent extraction perspective. The tournament perspective contends that substantial pay disparity between executives and workers acts as a competitive incentive, encouraging individuals to strive for executive positions (Kale et al., 2009). On the other hand, the rent extraction perspective posits that pay disparity reflects the bargaining power of CEOs, with greater pay disparity indicative of a more entrenched CEO (Bebchuk & Fried, 2003; Bebchuk et al., 2011).

Advocates of a large pay disparity assert that it is either advantageous or inevitable for firms. They argue that the large pay disparity provides promotion-based incentives for other executives and workers to compete for the higher position. In particular, Lazear and Rosen (1981), one of the earliest studies on the tournament theory, proposes that a significant pay disparity can enhance the motivation of contenders seeking the higher or executive position, resulting in improved overall firm operational performance (Eriksson, 1999; Kale et al., 2009; Lee et al., 2008). A number of recent studies provide empirical support for the tournament perspective, which favors a large pay disparity. For instance, Faleye et al. (2013) indicate that rank-and-file employees perceive greater opportunities in high pay ratios, provided they possess a reasonable probability of success in sequential promotion tournaments. In a similar vein, Cheng et al. (2017) show a positive association between CEO pay ratios and both firm performance and value, with high CEO compensation being positively correlated with indicators of CEO competence. Main et al. (1993) and Lee et al. (2008) reveal that in a typical rank-order tournament, ascending to the CEO position entails greater power, an enhanced reputation, and increased remuneration, thereby fostering competition and driving other executives to contribute their unique human capital and exert greater effort, ultimately resulting in improved outcomes and firm value.

Conversely, the rent extraction perspective interprets a large pay disparity as a signal of managerial opportunism and rent extraction, stemming from inadequate corporate governance and monitoring mechanisms. Compensation serves as an instrument to align the interests of shareholders and executives. In accordance with agency theory, executive compensation packages ought to be structured in a manner that provides executives with

adequate incentives to prioritize the maximization of shareholder interests (Jensen & Meckling, 1976; Sundaram & Yermack, 2007). Nonetheless, numerous studies have revealed that executives may exploit their managerial authority and power over the board of directors to secure additional compensation that is not directly related to shareholder wealth (Bebchuk & Fried, 2003; Bebchuk et al., 2002).

Bebchuk and Fried (2003) contend that the executive compensation decision-making process in the United States predominantly aligns with the rent extraction perspectives as opposed to the optimal contracting perspective. Corroborating this notion, Core et al. (1999) indicate that CEOs of companies experiencing greater agency problems are more likely to receive higher compensation. Furthermore, they suggest that firms with greater agency problems tend to perform poorly. Bebchuk and Fried (2004) also introduce an influential theory asserting that CEOs can leverage their managerial authority and sway to influence their compensation scheme in a way that optimizes their private interests. This self-serving behavior is denoted as "rent" extraction, with "rent" signifying the additional compensation acquired by the CEO. Consequently, CEO rent extraction amplifies the pay disparity. These findings compromise the efficacy of compensation incentives in aligning interests. Therefore, a large pay disparity between a firm's CEO and its rank-and-file employees is often perceived as a warning sign that the CEO is deriving private benefits through their compensation packages, a viewpoint consistent with the "rent extraction" perspective (Core et al., 1999; Grinstein & Hribar, 2004; Morse et al., 2011). In line with this, Morse et al. (2011) document powerful CEOs can induce boards to shift the weight on performance measures toward the better performing measures. Grinstein and Hribar (2004) also document powerful CEOs receive larger bonuses for completing merger and acquisition transactions unrelated to deal performance.

The determinants of corporate investment efficiency have consistently been a vital area of research within the realms of corporate finance and accounting literature. Without any friction, firms' investment decisions are expected to be efficient (Modigliani & Miller, 1958); nevertheless, deviations from optimal investment arise due to information asymmetry and agency problems, which result in inefficiencies in investment decisions (Chen et al., 2013; Chen et al., 2017; Majeed & Ullah, 2020). The opportunistic behavior of managers driven by empire-building and private benefit maximization gives rise to moral hazard and agency problems, subsequently prompting investment inefficiency (Aggarwal & Samwick, 2006). In the context of managerial opportunism, managers may allocate resources to suboptimal projects with negative net present value (NPV), thereby increasing their entrenchment and rent extraction within the organization. This pursuit of private benefits and rent extraction contributes to adverse selection and agency problems, which in turn foster suboptimal investment (Biddle et al., 2009; Majeed & Ullah, 2020; Mueller, 1969). Thus, moral hazard and agency problems may culminate in investment inefficiency.

Specifically, drawing upon these theoretical underpinnings, prior studies related to the rent extraction perspective imply a positive association between pay disparity and investment inefficiency, as CEO rent extraction and its associated activities increase investment inefficiency in at least two channels. Firstly, the executive compensation scheme serves as a prevalent mechanism to align managers' and shareholders' interests, thereby reducing agency costs (Lei, 2017). When CEOs are able to extract extra compensation unrelated to firm performance, the efficacy of the mechanism is undermined, resulting in elevated agency costs and investment inefficiency. Secondly, monitoring is one of the most effective methods for addressing agency conflicts between managers and shareholders. However, previous research indicates that managers focusing on maximizing private benefits tend to impair the monitoring and disciplinary capabilities of boards of directors and shareholders (Cohen et al., 2012; Lei, 2017). Prior studies also reveal that such managers tend to reduce disclosures or manage earnings to augment their compensation (Hope & Thomas, 2008; Holthausen et al., 1995). Given that accounting disclosures is a widely employed monitoring mechanism and shareholders depend on accounting information to assess and monitor managerial activities (Biddle et al., 2009; Dechow, 1994), managerial opportunistic behavior further increases

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investment inefficiency. In general, the previous research advocating rent extraction perspectives suggests that pay disparity would have negative effect on investment efficiency by increasing the inefficiency on a firm's investment.

Financial reporting and disclosure quality is a crucial attribute that can mitigate both managerial opportunistic behavior and information asymmetries (Chen et al., 2011; Dechow, 1994). In particular, Chen et al. (2011) suggest that firms with high agency costs suffer from investment inefficiency and therefore deviate from their optimal investment levels. In this respect, previous studies show that high-quality financial reporting and information environment reduce information asymmetries by enabling effective monitoring of management, and diminishing agency problems and adverse selection, thereby constraining sub-optimal investment decisions (Biddle et al., 2009; Majeed & Ullah, 2020). McNichols and Stubben (2008) contend that superior quality information streamlines the monitoring of management and assists in making optimal investment decisions, as managers are better equipped to invest in more appealing projects. Similarly, Chen et al. (2011) contend that earnings quality reduces information asymmetry issues and fosters a conducive monitoring environment. They propose that high earnings quality can restrict managerial opportunism, which subsequently reduces investment inefficiency. In this context, Biddle et al. (2009), Chen et al. (2011), and Boubaker et al. (2018) demonstrate that earnings quality facilitates firms in identifying investment problems and enables shareholders to assess and monitor the relevance and efficacy of managers' investment decisions.

The Committee of Sponsoring Organizations (COSO, 2013, p. 2) defines internal control (IC) as "a process, effected by an entity's board of directors, management, and other personnel, designed to provide reasonable assurance regarding the achievement of objectives relating to operations, reporting, and compliance." As delineated in the definition, a primary goal of IC is to ensure the reliability, timeliness, and transparency of financial disclosures. In this regard, prior studies have provided evidence that IC is a system that constrains managerial opportunistic behavior, and efficiently mitigates agency problems through motivation and monitoring (Chen et al., 2021; Choi et al., 2021). Concurrently, IC bolsters the reliability and quality of financial reporting while reducing information asymmetry (Chen et al., 2021; Hermanson, 2000). In sum, prior studies show that IC serves as an efficacious means of addressing diverse discrepancies stemming from information asymmetry and agency problems. Considering IC's crucial role in determining the caliber of financial reporting and disclosures, previous studies, including Cheng et al. (2013) and Choi et al. (2021), have revealed a significant association between IC and a firm's investment efficiency.

Human resources are essential for maintaining a firm's IC. Considering the importance of human resource within a firm, Public Company Accounting Oversight Board (PCAOB) highlights that a decrease in IC-related staff raises the likelihood of IC deficiencies. In this regard, Choi et al. (2013) explore the influence of investing in IC-related human resources on the disclosure of IC weaknesses, identifying a negative relationship between these variables. They also find a positive link between changes in the proportion of IC-related staff and the probability of correcting previously disclosed IC weaknesses. Consequently, they contend that firms with a greater number of IC personnel are more adept in monitoring and detecting error and potential fraud than firms with less IC personnel. Consistently, Shin et al. (2017) demonstrate that the higher work experience of personnel involved in IC processes mitigates audit reporting delays. This evidence suggests that allocating resources to IC-related human capital improves the reliability and caliber of financial reporting. Corroborating this result, Choi et al. (2021) assert that human resource investments in ICs enhance a firm's investment efficiency.

In summary, the existing literature suggests investment in IC-related human capital improves a firm's standard of IC, leading to the inference that such investment enhances a firm's quality of financial reporting and monitoring environment. Previous studies further indicate that a high-quality financial reporting and monitoring environment boosts a firm's investment efficiency by diminishing information asymmetry and resolving agency problems. Consequently, investment in IC personnel would mitigate the negative effect of pay disparity on a firm's investment efficiency.

In scrutinizing the link between pay disparity and investment inefficiency, this study aims to offer a more profound understanding of the impact of pay disparity. Additionally, the study explores the mitigating effects of quantitative and qualitative investment in IC personnel. Drawing from prior literature reviews and discussions, the study postulates a positive association between pay disparity and a firm's investment inefficiency. Furthermore, it is anticipated that both quantitative and qualitative investments in IC personnel will critically influence the positive relationship between pay disparity and investment inefficiency. Consequently, the following hypotheses are proposed for this study:

H1: There is a positive association between pay disparity and a firm's investment inefficiency.

H2: Human resource investment in ICs would mitigate the positive association between pay disparity and a firm's investment inefficiency.

2. METHOD

Conceptually, investment efficiency refers to firms engaging exclusively in investment projects with positive NPV. Following prior studies, including Biddle et al. (2009) and Chen et al. (2011), this study measures investment inefficiency by examining deviations from expected investment level through a model predicting investment as a function of sales growth. Specifically, this study estimates a firm-specific investment model as a function of growth opportunities, represented and measured by sales growth, and utilizes the residual values as a firm-specific measure for investment inefficiency (deviations from expected investment). The absolute value of residuals is employed, signifying that larger residual values correspond to greater investment inefficiency. The model is described as follows:

$$Investment_{it+1} = \beta_0 + \beta_1 SalesGrowth_{it} + \varepsilon_{it+1}. \quad (1)$$

Investment indicates the total investment in year $t + 1$, while *SalesGrowth* denotes the percentage change in sales from year $t - 1$ to t. The model (1) is estimated for each industry-year, with all variables winsorized at the 1 and 99 percent level to address the impact of outliers.

Upon measuring the level of inefficiency from model (1), the subsequent model is employed to examine the first hypothesis:

$$\begin{aligned} InvEfficiency_{it} &= \beta_0 + \beta_1 Disparity_{it} + \\ &+ \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 LOSS_{it} + \\ &+ \beta_5 CASH_{it} + \beta_6 CFO_{it} + \beta_7 ROA_{it} + \\ &+ \beta_8 CURRENT_{it} + \beta_8 AGE_{it} + \sum IND + \\ &+ \sum YEAR + \varepsilon_t, \end{aligned} \quad (2)$$

where *InvEfficiency* denotes the level of investment inefficiency of a firm, which is measured by the absolute value of residuals from model (1). *Disparity* is a variable of interest, representing ratio of executive directors' average pay to employees' average pay (Shin et al., 2015). Following previous research, the model includes control variables that could significantly influence a firm's investments, such as firm size (*SIZE*), leverage (*LEV*), current ratio (*CURRENT*), cash holdings (*CASH*), and firm age (*AGE*). In addition, cash flow from operations (*CFO*), return on asset (*ROA*), and loss (*LOSS*) are encompassed in the model to address financial and market factors that may impact a firm's investment efficiency. A comprehensive explanation of each variable used in the analysis is provided in the Appendix. Furthermore, fixed-effect model is employed to control for unobserved, time-invariant heterogeneity within year and industry.

To examine the impact of investment in IC personnel in the association between the pay disparity and firm's level of investment inefficiency, the study estimates the following model:

$$\begin{aligned} InvEfficiency_{it} &= \beta_0 + \beta_1 Disparity_{it} + \\ &+ \beta_2 Wor\ker\left(CPA\right)_{it} + \\ &+ \beta_3 Disparity \cdot Wor\ker\left(CPA\right)_{it} + \\ &+ \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \beta_6 LOSS_{it} + \\ &+ \beta_7 CASH_{it} + \beta_8 CFO_{it} + \beta_9 ROA_{it} + \\ &+ \beta_{10} CURRENT_{it} + \beta_{11} AGE_{it} + \\ &+ \sum IND + \sum YEAR + \varepsilon_t. \end{aligned} \quad (3)$$

To examine the influence of quantitative and qualitative investment in IC personnel on the relationship between the pay disparity and a firm's level of investment inefficiency, this study

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incorporates proxies for quantitative and qualitative human resource investment in IC (*Worker* and *CPA*) and the interaction term, *Disparity · Worker(CPA)*, into the model. In model (3), *Worker* represents the quantitative investment in IC personnel, measured by the proportion of employees responsible for IC relative to the total number of employees in the firm. Meanwhile, *CPA* denotes the ratio of the total number of IC-responsible employees who holds a Certified Public Accountant (CPA) license to the total number of the employees, representing the qualitative investment in IC personnel. β_3 shows the role of quantitative and qualitative investment in IC personnel in the association between pay disparity and a firm's investment inefficiency level. All remaining variables are the same as the ones in model (2).

This study utilizes and investigates Korean listed companies between 2018 and 2020. Financial information and executive compensation data are gathered from the Korean databases, TS2000 and FnGuide, which are similar to the Compustat database in the U.S. The number of IC personnel is manually extracted from the "Report on the operation of the internal control system," which is a section within each firm's annual report. Due to distinct industry features, financial institutions are omitted from the sample. Furthermore, to maintain sample consistency, firms with non-December fiscal year-ends are also removed. Lastly, firms with incomplete data for the required variables are eliminated from the sample, yielding a sample of 5,407 firm-year observations.

3. RESULTS

Descriptive statistics for each variable involved in the analysis is shown in Table 1. Each continuous variable is winsorized at the top and bottom of 1 percent. The dependent variable, *InvEfficiency*, has mean and median values of 0.592 and 0.075, respectively. Additionally, Table 1 reveals an average *Disparity* of 6.099. The average of *Worker* and *CPA* are 0.088 and 0.003, respectively, suggesting that, on average, nearly 9% of all employees participate in IC roles, and 0.3% of the total employees are IC-related personnel holding a CPA license.

Table 2 displays the Pearson correlations, demonstrating a positive correlation between the dependent variable, *InvEfficiency*, and the independent variable, pay disparity (*Disparity*). Additionally, *InvEfficiency* is significantly correlated with human resource investment in IC (*Worker* and *CPA*). However, drawing a definitive conclusion about the impact of pay disparity on a firm's investment efficiency solely from the Pearson correlation analysis proves difficult. The results of regression analyses, which include all variables employed in the analyses, are presented in the subsequent tables.

Table 1. Descriptive statistics

Variable	N	Mean	Standard deviation	Median	25%	75%
InvEfficiency	5,407	0.592	1.280	0.194	0.075	0.499
Over_InvEfficiency	3,886	0.639	1.459	0.186	0.076	0.457
Under_InvEfficiency	1,521	0.471	0.603	0.230	0.073	0.618
Disparity	5,407	6.099	5.736	4.547	2.890	7.026
Worker	5,407	0.088	0.136	0.047	0.024	0.093
CPA	5407	0.003	0.010	0.000	0.000	0.001
SIZE	5,407	12.201	1.313	11.971	11.307	12.831
LEV	5,407	0.363	0.203	0.357	0.194	0.509
LOSS	5,407	0.344	0.475	0.000	0.000	1.000
CASH	5,407	0.112	0.149	0.066	0.026	0.142
CFO	5,407	0.038	0.087	0.039	-0.003	0.086
ROA	5,407	-0.008	0.128	0.018	-0.028	0.052
CURRENT	5,407	3.262	4.780	1.676	1.010	3.328
AGE	5,407	2.562	0.877	2.773	2.079	3.178

Notes: (1) All variables are defined in the Appendix. (2) All continuous variables were winsorized at the top and bottom 1%. (3) All *p*-values are based on two-tailed tests.

Table 2. Correlations (p-values below)

Variable		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	*InvEfficiency*	0.364	(0.171)	(0.096)	0.552	0.147	(0.058)	(0.100)	0.105	0.059	(0.111)	0.098
		<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
(2)	*Disparity*	–	(0.132)	(0.043)	0.421	0.008	(0.144)	(0.079)	0.131	0.163	(0.053)	0.051
		–	<.001	<.001	<.001	0.546	<.001	<.001	<.001	<.001	<.001	<.001
(3)	*Worker*	–	–	0.446	(0.164)	(0.216)	0.091	0.008	(0.175)	(0.137)	0.254	0.066
		–	–	<.001	<.001	<.001	<.001	0.578	<.001	<.001	<.001	<.001
(4)	*CPA*	–	–	–	–0.029	–0.151	0.027	0.019	–0.075	–0.035	0.128	–0.047
		–	–	–	0.033	<.001	0.050	0.160	<.001	0.011	<.001	<.001
(5)	*SIZE*	–	–	–	–	0.148	(0.224)	(0.234)	0.201	0.270	(0.154)	0.264
		–	–	–	–	<.001	<.001	<.001	<.001	<.001	<.001	<.001
(6)	*LEV*	–	–	–	–	–	0.248	(0.125)	(0.118)	(0.276)	(0.532)	0.071
		–	–	–	–	–	<.001	<.001	<.001	<.001	<.001	<.001
(7)	*LOSS*	–	–	–	–	–	–	0.008	(0.404)	(0.666)	(0.051)	(0.027)
		–	–	–	–	–	–	0.575	<.001	<.001	<.001	0.046
(8)	*CASH*	–	–	–	–	–	–	–	0.054	0.022	0.164	(0.243)
		–	–	–	–	–	–	–	<.001	<.001	<.001	<.001
(9)	*CFO*	–	–	–	–	–	–	–	–	0.506	(0.039)	0.043
		–	–	–	–	–	–	–	–	<.001	0.004	0.002
(10)	*ROA*	–	–	–	–	–	–	–	–	–	0.059	0.034
		–	–	–	–	–	–	–	–	–	<.001	0.014
(11)	*CURRENT*	–	–	–	–	–	–	–	–	–	–	(0.137)
		–	–	–	–	–	–	–	–	–	–	<.001
(12)	*AGE*	–	–	–	–	–	–	–	–	–	–	–
		–	–	–	–	–	–	–	–	–	–	–

Notes: (1) All variables are defined in the Appendix. (2) All continuous variables were winsorized at the top and bottom 1%. (3) All *p*-values are based on two-tailed tests.

The empirical results for the first hypothesis are displayed in Table 3. Table 3 shows that the coefficient of Disparity is 0.034, which is statistically significant and positive at the 1% level, supporting the rent extraction view and suggesting that a large pay disparity contributes to increased investment inefficiency within the firm. Furthermore, this study shows that SIZE, LEV, CASH, CFO,

Table 3. Pay disparity and a firm's investment inefficiency

Variable	Dependent variable = $InvEfficiency_{it}$	
	Coef.	p-value
Intercept	–6.878	<0.01
$Disparity_{it}$	0.034	<0.01
$SIZE_{it}$	0.530	<0.01
LEV_{it}	0.206	0.02
$LOSS_{it}$	0.033	0.39
$CASH_{it}$	0.168	0.09
CFO_{it}	0.363	0.05
ROA_{it}	–0.971	<0.01
$CURRENT_{it}$	0.005	0.19
AGE_{it}	–0.029	0.09
Industry fixed effect	YES	
Year fixed effect	YES	
Adj. R^2	0.4125	
N	5,407	

Notes: (1) All variables are defined in the Appendix. (2) All continuous variables were winsorized at the top and bottom 1%. (3) All *p*-values are based on two-tailed tests.

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ROA, and AGE are significantly related to a firm's investment inefficiency. This result supports prior studies supporting the rent extraction view regarding the effect of large pay disparity, such as Bebchuk and Fried (2003), Chen et al. (2017), and Majeed and Ullah (2020).

Regression results for the second hypothesis are shown in Table 4. Panel A displays the outcomes of the regression model (3) using the *Worker* variable. It depicts the outcomes of regressing the investment inefficiency on the interaction between the pay disparity and quantitative investment in IC personnel (*Disparity · Worker*). The result reveals that the coefficient of the interaction term *Disparity · Worker* is negative (–0.246) and statistically significant (p-value < 0.01). This finding indicates that quantitative investment in IC personnel mitigates the positive association between pay disparity and a firm's investment inefficiency.

Panel B illustrates the effect of qualitative human resource investment in IC (*CPA*) on the relationship between pay disparity and a firm's investment inefficiency. The result shows that the coefficient of the interaction term *Disparity · CPA* is negative (–2.104) and significant at 1% level (p-value < 0.01). This result implies that qualitative investment in IC personnel mitigates the detrimental impact of a considerable pay disparity on a firm's investment efficiency. The results for the second hypothesis is in line with the prior studies showing that both quantitative and qualitative investment in IC personnel enhances the quality of a firm's financial reporting and monitoring environment, as well as its investment efficiency (Choi et al., 2013; Choi et al., 2021; Shin et al., 2017).

To elucidate the way in which pay disparity affect a firm's investment inefficiency, this study carries out the analysis utilizing the signed value of residuals from model (1), as opposed to the absolute value of residuals. Furthermore, the study examines the relationship between pay disparity and investment inefficiency, dividing samples based on the investment level of the firm: overinvestment and underinvestment. Table 5 presents the results of the additional analysis, revealing that the effect of pay disparity is statistically significant only for firms experiencing overinvestment issues. The re-

Table 4. Role of human resource investment in IC on the association between pay disparity and investment inefficiency

Panel A: Quantitative human resource investment in IC

Variable	Dependent variable = $InvEfficiency_{it}$	
	Coef.	p-value
Intercept	–6.728	<0.01
$Disparity_{it}$	0.050	<0.01
$Disparity_{it} \cdot Worker_{it}$	–0.246	<0.01
$Worker_{it}$	0.936	<0.01
$SIZE_{it}$	0.512	<0.01
LEV_{it}	0.135	0.12
$LOSS_{it}$	0.046	0.23
$CASH_{it}$	0.164	0.09
CFO_{it}	0.312	0.09
ROA_{it}	–0.925	<0.01
$CURRENT_{it}$	0.004	0.22
AGE_{it}	–0.024	0.16
Industry fixed effect	YES	
Year fixed effect	YES	
Adj. R^2	0.4281	
N	5,407	

Notes: (1) All variables are defined in the Appendix. (2) All continuous variables were winsorized at the top and bottom 1%. (3) All *p*-values are based on two-tailed tests.

Table 4 (cont.). Role of human resource investment in IC on the association between pay disparity and investment inefficiency

Panel B: Qualitative human resource investment in IC

Variable	Dependent variable = $InvEfficiency_{it}$	
	Coef.	p–value
Intercept	–6.808	<0.01
$Disparity_{it}$	0.039	<0.01
$Disparity_{it} \cdot CPA_{it}$	–2.104	<0.01
CPA_{it}	5.376	0.01
$SIZE_{it}$	0.525	<0.01
LEV_{it}	0.133	0.13
$LOSS_{it}$	0.031	0.41
$CASH_{it}$	0.156	0.11
CFO_{it}	0.292	0.11
ROA_{it}	–0.990	<0.01
$CURRENT_{it}$	0.003	0.44
AGE_{it}	–0.033	0.05
Industry fixed effect	YES	
Year fixed effect	YES	
Adj. R^2	0.4210	
N	5,407	

Notes: (1) All variables are defined in the Appendix. (2) All continuous variables were winsorized at the top and bottom 1%. (3) All *p*-values are based on two-tailed tests.

Table 5. Additional analysis

Variable	Dependent variable = $Over\_InvEfficiency_{it}$		Dependent variable = $Under\_InvEfficiency_{it}$	
	Coef.	p-value	Coef.	p–value
Intercept	–8.179	<0.01	–0.558	0.10
$Disparity_{it}$	0.036	<0.01	–0.001	0.87
$SIZE_{it}$	0.640	<0.01	0.015	0.37
LEV_{it}	0.093	0.39	–0.319	<0.01
$LOSS_{it}$	0.073	0.13	0.069	0.07
$CASH_{it}$	0.182	0.16	–0.074	0.40
CFO_{it}	0.328	0.17	–0.539	<0.01
ROA_{it}	–1.141	<0.01	0.043	0.78
$CURRENT_{it}$	0.002	0.59	0.003	0.30
AGE_{it}	0.002	0.93	0.070	<0.01
Industry fixed effect	YES		YES	
Year fixed effect	YES		YES	
Adj. R^2	0.4853		0.2984	
N	3,886		1,521	

Notes: (1) All variables are defined in the Appendix. (2) All continuous variables were winsorized at the top and bottom 1%. (3) All *p*-values are based on two-tailed tests.

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sults indicate that the coefficient of Disparity for firms with overinvestment is 0.036 and statistically significant (p-value < 0.01). Conversely, the coefficient of *Disparity* (–0.001) for firms facing underinvestment issues is not significant (p-value = 0.87).

4. DISCUSSION

The result suggests a positive association between pay disparity and a firm's level of inefficiency, indicating that investment decisions of firms with larger pay disparities are more inefficient. This finding supports the rent extraction perspective, which posits that a large pay disparity is a clear signal of managerial rent extraction and opportunism. Previous studies have proven that CEO rent extraction and its related managerial opportunistic behavior exacerbate the agency problems and harm the monitoring environment of the firm. Collectively, the findings support the contention that a large pay disparity signifies managers' rent extraction and opportunistic managerial behaviors, such as empire-building behavior and private benefit maximization, and exacerbate investment inefficiency by contributing to moral hazard and agency problems. Consistent with previous studies, including Bebchuk and Fried (2003), Bebchuk et al. (2002), Biddle et al. (2009), Chen et al. (2013), Chen et al. (2017), and Majeed and Ullah (2020), this study advocates the rent extraction view regarding the effect of large pay disparity. At the same time, the result contradicts studies supporting the tournament incentive perspectives, such as Lazear and Rosen (1981), Faleye et al. (2013), and Cheng et al. (2017).

The result for the second hypothesis of this study further shows that both quantitative and qualitative human resource investment in IC alleviates the adverse impact of pay disparity on investment efficiency of a firm. Specifically, Panel A of Table 4 demonstrates that the net effect, i.e., the sum of the coefficients of β_1 and β_3, remains negative (0.050 + –0.246), indicating that quantitative human resource investment in IC reduces the level of investment inefficiency. This result also reveals that when *Worker* is held at 0.088 (the average value of *Worker* for the entire sample), the level of inefficiency (*InvEfficiency*) is increased by approximately 0.028 ($\beta_1 + \beta_3 \cdot 0.088 = 0.050 + -0.246 \cdot 0.088 = 0.028352$), suggesting that the marginal effect of pay disparity ($\beta_1 = 0.050$) decreases as *Worker* increases. Panel B of Table 4 also shows the qualitatively consistent result, demonstrating that when *CPA* is held at 0.003, (the average value of *Worker* for the entire sample), the level of inefficiency (*InvEfficiency*) is increased by approximately 0.033 ($\beta_1 + \beta_3 \cdot 0.003 = 0.039 + -2.104 \cdot 0.003 = 0.03268$), suggesting that the marginal effect of pay disparity ($\beta_1 = 0.039$) also decreases as *CPA* increases.

In sum, the findings suggest that investing in human resources for IC, both quantitatively and qualitatively, can effectively mitigate the negative influence of pay disparity on investment efficiency. By enhancing the financial reporting and monitoring quality within a firm, investment in human resources for IC can help reduce agency problems and moral hazard, ultimately leading to more efficient investment decisions. This result is consistent with prior studies showing that the investment in IC personnel enhance the firm's efficacy of IC and operations, including Choi et al. (2013), Shin et al. (2017), and Choi et al. (2021).

CONCLUSION

The purpose of this study is to examine the effect of pay disparity on a firm's investment inefficiency, which can arise when firms either overinvest or underinvest in projects with positive NPV. Additionally, the study investigates how human resource investment in IC influences the association between pay disparity and investment inefficiency.

The study's main result is that there is a positive association between pay disparity and a firm's level of investment inefficiency. In addition, the study shows that the pay disparity increases the level of investment inefficiency by increasing a firm's overinvestment. The study also finds that the positive relationship between pay disparity and investment inefficiency is mitigated with more investment in IC personnel.

By examining these relationships, the study provides deeper understanding of the conflicting evidence regarding the impact of pay disparity. The results hold practical implications for firms and policymakers. By recognizing the negative effects of pay disparity on investment efficiency, firms can strive to create more equitable compensation structures that minimize agency conflicts and moral hazard. Furthermore, firms can invest in their IC systems, particularly in human resources responsible for IC, to enhance the monitoring and information environment, ultimately leading to more efficient investment decisions. Policymakers can also draw on these findings to develop regulations that encourage greater transparency and monitoring mechanisms in organizations, fostering a more effective corporate governance landscape.

AUTHOR CONTRIBUTIONS

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Formal analysis: Inkyung Yoon.
Investigation: Inkyung Yoon.
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Supervision: Dongjoon Choi.
Validation: Dongjoon Choi.
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APPENDIX

Table A1. Variable definition

Variable	Definition
	Dependent Variables
InvEfficiency	Following Biddle et al. (2009), regress firm's $SalesGrowth_t$ onto firm's $investment_{t+1}$ by industry year, then calculate the absolute value of residual which means investment inefficiency
Over_InvEfficiency	If ***InvEfficiency*** is positive, has a same value of ***InvEfficiency***
Under_InvEfficiency	If ***InvEfficiency*** is negaitive, has an absolute value of ***InvEfficiency***
	Independent Variables
Disparity	Executive directors' average pay divided by employees' average pay
Worker	Number of employees responsible for IC divided by the total number of firm's employees
CPA	Number of employees responsible for IC who has CPA license divided by the total number of firm's employees
	Control Variables
SIZE	Natural logarithm of total assets
LEV	Total liability divided by total asset
LOSS	Indicator variable that equals 1 if firm's net income is negative and zero otherwise
CASH	Cash & cash equivalents divided by total asset
CFO	Cash flow from operations divided by total asset
ROA	Net income divided by total asset
CURRENT	Current asset divided by current liabilities
AGE	Natural logarithm of firm age

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