

Executive–Employee Pay Disparity and Investment Efficiency: Evidence from an Emerging Market

Abstract

The recent mandate on CEO pay ratio disclosure has heightened attention to within-firm pay disparities by comparing CEO compensation with median employee pay. This study examines the association between executive-employee pay disparity and corporate investment efficiency in an emerging market setting characterized by concentrated ownership, high power distance, and collectivist cultural norms. Using a sample of Indian listed non-financial firms, we find that greater within-firm pay disparity is associated with lower investment efficiency, consistent with the rent extraction view of executive compensation. This adverse relationship is amplified by higher risk-taking, greater reliance on variable pay, and weaker board monitoring. Our heterogeneity analyses show that the explained component of the CEO pay ratio enhances investment efficiency while the unexplained component reduces it, and long-horizon managers and stronger external monitoring mitigate the adverse relationship. Rent extraction concerns are more pronounced in high power distance and non-family managed firms. A conditional positive association between pay ratio and labor investment efficiency suggests asymmetric managerial allocation behavior, further consistent with rent extraction. Overall, our findings highlight the real effects of vertical pay inequality and the role of governance and ethical considerations in shaping investment outcomes in emerging markets.

Keywords: CEO-to-median employee pay ratio, Investment efficiency, Rent extraction, Corporate Governance, India.

1. Introduction

A popular press article noted that "year after year, CEO pay explodes while workers' wages barely budge," highlighting the persistent and widening compensation gap among firms.¹ The disparity between CEO and employee pay has become a prominent feature of modern corporate structures. In 1965, CEOs in the United States earned approximately 21 times the average worker's salary. However, this ratio had increased significantly to nearly 290:1 in 2023.² In the UK, FTSE 100 CEOs earned 120 times the average worker's salary.³ Similarly, Indian CEO compensation has increased by 40% post-COVID, while entry- and mid-level wages have remained largely stagnant (Deloitte, 2024). Although this pay ratio disclosure mandate is designed to enhance pay transparency, it may also impact corporate policies, including capital allocation decisions (Pan et al., 2022). Despite extensive research on shareholder reactions, say-on-pay votes, and employee perceptions, relatively little attention has been paid to the real economic consequences of such disparities. This study addresses this gap by examining the relationship between the CEO pay ratio and investment efficiency in India.

Managers are entrusted with capital to invest in projects that maximize long-term firm value, and executive compensation is often justified on the basis of these fiduciary responsibilities. However, in environments characterized by substantial pay disparities and weak monitoring, executives may deviate from these ethical obligations and pursue private benefits rather than prioritizing shareholder interests. Prior research indicates that managerial characteristics play a significant role in shaping investment efficiency, including executive remuneration (Eisdorfer et al., 2013), managerial ability (Gan, 2019), CEO power (Chowdhury et al., 2023), CEO-to-executive pay gap (Colak et al., 2021), CEO awards or media exposure (Zhang & Cai, 2023),

¹ <https://www.oxfam.org/en/press-releases/global-ceo-pay-increased-50-percent-2019-56-times-more-worker-wages> (last accessed 14/02/2026).

² <https://fortune.com/2025/04/15/ceo-worker-pay-gap-problem-america/> (last accessed 14/02/2026).

³ <https://www.theguardian.com/business/article/2024/aug/12/ceo-pay-high-ftse-100-chief-executive> (last accessed 14/02/2026).

and career concerns (Xie, 2015). Recent evidence also highlights the importance of employee attributes, such as education (Jin et al., 2023) and satisfaction (Arvidsson et al., 2024), in shaping firms' investment decisions. Accordingly, this study investigates whether within-firm pay disparities—measured as the ratio of CEO compensation to median employee compensation—affect investment efficiency.⁴ Unlike abnormal CEO pay that captures only CEO excess compensation relative to economic benchmarks, the CEO-to-median employee pay ratio simultaneously reflects managerial rent extraction incentives and employee fairness perceptions, operating through distinct channels to affect investment behavior. Furthermore, a high CEO-to-worker pay ratio can arise even in the absence of abnormal CEO pay, through the disproportionate growth of executive compensation relative to stagnant worker wages.

Theoretically, the CEO pay ratio reflects a fundamental trade-off. Optimal contracting and talent assignment theories suggest that high pay differentials signal exceptional managerial talent and well-designed incentives (Mueller et al., 2017; Rosen, 1981), with prior studies showing that high CEO pay disparity is associated with enhanced productivity, improved firm performance, and balanced labor investments (Banker et al., 2016; Faleye et al., 2013; Li et al., 2024). In contrast, the rent extraction hypothesis posits that entrenched CEOs exploit their influence to inflate compensation, often at the expense of shareholder value (Bebchuk et al., 2011), with unjust pay gaps reducing employee satisfaction and firm performance (Bao et al., 2020; Rouen, 2020), and hindering productivity growth (Boone et al., 2024). While recent studies examine pay disparity as an equilibrium outcome of disclosure and stakeholder pressure (Cheng & Zhang, 2024; Choi et al., 2025) or dynamic contracting (Akins et al., 2025; Bushman et al., 2025; Kubick et al., 2024), our study treats pay disparity as an input to managerial

⁴ Unless otherwise stated, investment refers to firm-level capital investment rather than labor investment.

investment decisions, examining its real economic consequences in a setting where these disciplinary mechanisms are largely absent.

India provides an ideal setting to explore these competing mechanisms. Ownership is concentrated among business groups and families, unlike the dispersed ownership in the US. Equity-based compensation and stock-return-based performance metrics are common in CEO compensation in the US, but not in India (Jaiswall & Raman, 2021).⁵ Pay-ratio disclosures have fed into activist agendas and labor negotiations in the US, while similar disclosures in India have elicited little institutional response.⁶ Finally, India's socio-cultural environment differs substantially from that of developed economies. India ranks very high in power distance compared to the US, and wide salary ranges between the top and bottom of an organization are not a problem in high power distance cultures (Hofstede et al., 2010). Although power distance is associated with wider pay disparities, income is strongly and positively related to job satisfaction in such settings, implying that lower income may lead to greater employee dissatisfaction (Hauff & Richter, 2015). Additionally, India's collectivist orientation contrasts sharply with the US's individualism and differs significantly from China's Confucian collectivism. In these collectivist cultures, employees prefer group decision-making over individual assertiveness and encourage fair pay practices. Thus, India's unique combination of ownership structures, compensation practices, institutional responses, and cultural norms makes it an intriguing setting for studying the within-firm pay disparities on investment decisions.

⁵ Total CEO compensation in Indian firms includes fixed cash compensation (salary and sitting fees), non-fixed cash compensation (perquisites and employer's contribution to retirement funds), and variable component (bonus, commission, and stock options). Indian firms, unlike the US, are not required to disclose the performance metrics used in assessing CEO performance to determine total CEO pay (Jaiswall & Raman, 2021).

⁶ <https://timesofindia.indiatimes.com/business/india-business/ceo-pay-in-it-zooms-at-times-over-1000-times-median-salary/articleshow/112480169.cms> (last accessed 14/02/2026).

This study uses panel data on the CEO pay ratio for Indian listed companies from 2015 to 2023. Investment efficiency is proxied using investment expectation models (Richardson, 2006). Our baseline results show that firms with higher CEO pay ratios exhibit significantly lower investment efficiency, consistent with the rent extraction hypotheses. The results remain robust to alternative estimators, including investment-growth sensitivity analysis and alternative measures of efficiency, and to a range of additional robustness checks, including the 2SLS instrumental variable approach, the two-step Heckman selection procedure, Oster's test, GMM estimation, and a difference-in-difference analysis.

The mechanism analysis reveals that greater corporate risk-taking, high variable compensation, and reduced board monitoring amplify the negative association, consistent with the rent extraction argument. The heterogeneity analyses show that long-horizon managers and strong external monitoring mitigate this relationship. The CEO pay ratio explained by firm-level economic fundamentals enhances investment efficiency, while the unexplained component reduces it. We also find that the negative effect is pronounced in firms characterized by high power distance, limited family oversight, and smaller business group affiliation. Pay disparity is positively associated with human capital efficiency, conditional on higher employee pay and lower CEO pay ratios, further strengthening the rent extraction argument over optimal contracting. Lastly, firms that demonstrate higher investment efficiency show a positive association between the CEO pay ratio and future operating performance.

Our results contribute to the literature in three ways. First, we extend research on executive compensation by demonstrating that vertical pay inequality has consequential effects on firms' real investment decisions. Studies examining the CEO-to-median employee pay ratio have largely interpreted pay disparity as reflecting optimal contracting (Bardos et al., 2021) or managerial talent (Cheong et al., 2024; Mueller et al., 2017), with very limited evidence linking

pay disparity to rent extraction behavior (Bao et al., 2021). Our results show that excessive executive-employee pay disparity is associated with inefficient capital investment, consistent with managerial rent extraction rather than optimal contracting or exceptional talent, highlighting pay disparity as a governance failure that imposes economic costs through distorted resource allocation (Bebchuk et al., 2010; Evdokimov et al., 2022; Francis et al., 2008; Grinstein & Hribar, 2004; Hoi et al., 2019; Kim & Han, 2018; Masulis & Reza, 2023). Furthermore, unlike disclosure-focused studies that treat pay disparity as a stakeholder-constrained equilibrium outcome, our study demonstrates that in settings with limited institutional response to pay disclosures, as in India, the pay ratio more directly reflects unconstrained rent extraction with measurable consequences for capital allocation.

Second, our study extends the investment efficiency literature by examining corporate and labor investment decisions through the lens of managerial rent extraction using within-firm pay disparity. Prior studies predominantly explain investment efficiency through tournament incentives (Cai et al., 2021; Colak et al., 2021; Li & Wang, 2024; Mei & Deng, 2025), managerial characteristics (Chowdhury et al., 2023; James et al., 2025; Majeed et al., 2025; Tong et al., 2024; Xie, 2015; L. Zhang & Cai, 2023), or corporate governance mechanisms (Chowdhury et al., 2024; Khedmati et al., 2020; Rajkovic, 2020; Zhang et al., 2024). Our study contributes to this literature by jointly analyzing corporate investment and labor investment efficiencies, allowing us to capture managerial capital allocation decisions under differing incentive motives. This dual-investment perspective reveals that pay disparity may simultaneously distort capital investment while conditionally improving labor investment efficiency, highlighting an ethically important asymmetry in managerial behavior that a single-investment lens would miss.

Third, we provide unique evidence from an emerging market setting by analyzing firms in India characterized by concentrated ownership structures, limited institutional monitoring, relatively weaker governance frameworks, and distinct socio-cultural characteristics. This context allows us to capture the agency frictions that are less prevalent in developed economies but highly relevant to many other developing countries, offering policy-relevant insights between compensation design and investment efficiency in institutional environments marked by power asymmetries and governance constraints (La Porta et al., 1999).

2. Institutional environment

The Indian corporate landscape is starkly different from other economies, and better corporate governance does not always yield significant outcomes like other similar economies. While countries like the US or the UK mandated disclosure of the CEO-to-median employee pay ratio, India mandated all public companies (excluding Government-owned companies) to disclose the pay ratio of all directors and key managerial personnel.⁷ Indian firms are largely family-owned and family-managed, and inherit agency problems in their corporate governance framework. Given this context, managerial remuneration, especially in family-managed firms, raises serious concerns due to the rising conflicts of interest between promoter-managers and minority shareholders.

In order to safeguard the minority investors, Section 197 of the Companies Act, 2013 prescribes a maximum overall limit on managerial remuneration payable by a public company, capping total remuneration to directors at 11 percent of net profits for that financial year. However, this limit can be exceeded by shareholders through an ordinary resolution, and individual or

⁷ The mandate excludes government owned companies and companies operating in the defense industry.

multiple director remuneration limits can similarly be surpassed with a special resolution.⁸ Even loss-making companies can allow remuneration exceeding the statutory limits provided shareholders pass a special resolution. These cases allow promoter-managers to vote on their own remuneration during ordinary or special resolutions, unlike other related party transactions, where the concerned related party is excluded from voting. This boundaries-with-loopholes approach prescribes remuneration limits but simultaneously allows exceptions that undermine these controls.

Institutional Investor Advisory Services (IiAS) published a report assessing 201 remuneration resolutions for promoters presented in 2022, showing that 34% of these proposals would have been defeated had promoters not been allowed to vote.⁹ Reasons for investor dissent included the absolute level of compensation, weak disclosures, misalignment of pay-performance sensitivity, and promoter family remuneration, where promoter family members occupy board and office positions. CEO pay has increased by more than 40%, with media starting to raise concerns about skyrocketing CEO-to-median employee ratios, largely due to stagnated employee pay during the post-pandemic period. In this scenario, it becomes evident to examine whether the pay disparity reflects optimal contracting or rent extraction using corporate investment decisions.

3. Literature review and hypothesis development

3.1. Corporate investment efficiency

⁸ The Companies (Amendment) Act, 2017 discontinued the central government approval for exceeding such limits. For details, refer <https://www.mca.gov.in/content/dam/mca/pdf/CompaniesAct2013.pdf> (last accessed on 21/04/2026).

⁹ IiAS is an advisory firm dedicated to providing participants in the Indian market with independent opinions, research and data on corporate governance and ESG issues as well as voting recommendations on shareholder resolutions for about 1000 companies that account for over 95% of market capitalization. For full report, refer https://iias-cms.s3.ap-south-1.amazonaws.com/F1_1_Promoters_vote_their_own_salary_27_Jun2023_393f435bb5.pdf (last accessed on 15/02/2026)

A central issue in corporate finance is the efficient allocation of capital. In a frictionless market, firms are expected to undertake all projects with positive net present value (NPV), thereby maximizing shareholder wealth (Modigliani & Miller, 1958). Investment efficiency is realized when capital is allocated such that the marginal benefit of investment equals its marginal cost (Biddle et al., 2009; Chen et al., 2011).

Real-world frictions like agency conflicts and information asymmetry often distort investment decisions (Hubbard, 1997; Jensen & Meckling, 1976). Overinvestment may arise when self-interested managers exploit free cash flow to pursue empire-building and increase personal benefits (Jensen, 1986; Jensen & Meckling, 1976; Richardson, 2006), while underinvestment can occur when risk-averse managers forgo positive NPV projects to avoid job risk or scrutiny (Bertrand & Mullainathan, 2003). These frictions highlight the critical role of CEO incentives and governance structures in shaping capital allocation efficiency (Chowdhury et al., 2023). While incentive-based pay disparities enhance efficiency through tournament effects (Colak et al., 2021), CEO visibility and transparency mechanisms also play an important role in mitigating overinvestment (Zhang & Cai, 2023).

3.2. Optimal contracting hypothesis

The optimal contracting hypothesis posits that CEO compensation structures arise from efficient managerial contracting designed to align managerial incentives with shareholder interests. According to talent assignment theory, small differences in executive ability can generate disproportionately large differences in firm value, justifying substantial compensation premiums at the top of the organizational hierarchy (Rosen, 1981). Higher CEO pay ratios, therefore, primarily reflect superior managerial skill, responsibility for complex decision-making, and the convex nature of value creation by executives. From an agency perspective, performance-sensitive compensation and higher pay dispersion can mitigate moral hazard

problems by incentivizing CEOs to undertake value-enhancing investment decisions rather than diverting firm resources for private benefits (Gayle & Miller, 2009).

Empirical evidence is broadly consistent with this view. Faleye et al. (2013) show that CEO-to-employee pay disparity may be associated with higher labor productivity and firm value, while Banker et al. (2016) and Mueller et al. (2017) document positive associations between pay dispersion and firm performance. More recently, Li et al. (2024) report that higher CEO pay disparity is associated with more balanced labor investments, and Bardos et al. (2021) find that bondholders interpret high CEO pay disparity as a signal of efficient incentive alignment, reflected in lower borrowing costs. Collectively, this literature suggests that higher CEO pay ratios can be consistent with efficient contracting and improved capital allocation.

H1a: Higher CEO pay ratios are associated with greater investment efficiency.

3.3. Rent extraction hypothesis

In contrast, the rent extraction hypothesis argues that high CEO pay ratios may reflect managerial power rather than efficient incentive alignment. When CEOs are entrenched or face weak monitoring, they may influence the compensation-setting process to extract rents, leading to excessive pay that deviates from firm fundamentals (Bebchuk et al., 2011; Bebchuk & Fried, 2004). Entrenched CEOs may further pursue empire-building strategies, undertake value-destroying acquisitions, or allocate capital to projects that enhance personal reputation, job security, or private benefits rather than shareholder value (Jensen, 1986; Jian & Lee, 2011), resulting in systematic deviations from optimum investment levels. Importantly, this perspective does not require a specific directional bias toward over- or under-investment; rather, it predicts greater absolute deviations from optimal investment driven by agency conflicts.

Empirical evidence supports this perspective. Unexplained pay disparity is negatively associated with future firm performance (Bao et al., 2020; Rouen, 2020) and financial reporting quality (Bao et al., 2021). Song et al. (2025) document that exogenous increases in executive pay dispersion following tax cuts are associated with behavior indicative of managerial rent-seeking. Recent literature further highlights that pay disparity is partly shaped by disclosure, stakeholder scrutiny, and compensation design. Cheng and Zhang (2024) show that pay ratio disclosure reduces the pay gap through stakeholder pressure, while Choi et al. (2025) demonstrate that executive pay transparency influences relative performance evaluation. Dynamic contracting studies further highlight that compensation horizons are endogenously shaped by creditor pressures, contracting frictions, and risk incentives, with important implications for managerial behavior and firm outcomes (Akins et al., 2025; Bushman et al., 2025; Kubick et al., 2024). In settings where these disciplinary mechanisms are weak, observed pay disparities are likely to reflect unconstrained rent extraction, amplifying their adverse consequences for investment efficiency.

H1b: Higher CEO pay ratios are associated with lower investment efficiency.

4. Research design

4.1. CEO Pay Ratio

As per Section 197, Rule 5(1) of the Companies Act, 2013, Indian-listed firms are required to disclose the ratio of each director's remuneration to the median salary. Following Nagar and Arya (2025), this study focuses on the pay ratio of the highest-paid executive, hereafter referred to as the chief executive officer (CEO). There are three key reasons for this choice. First, in India, the firm's top executive may be designated as either a Managing Director (MD) or a CEO, often reflecting the same role (Banerjee & Homroy, 2018). Second, prior executive compensation studies commonly identify the highest-paid director as the CEO (Ferreira et al.,

2021; Firth et al., 1999). Finally, our study aims to examine the intra-firm wage inequality and investment efficiency; the highest-paid executive's pay ratio provides the most relevant measure of pay disparity.¹⁰

4.2.Measurement of investment efficiency

Investment efficiency is measured following the residual approach developed by Richardson (2006), as shown in Equation (1):

$$\begin{aligned} Invest_{i,t} = & \beta_0 + \beta_1 Growth_{i,t-1} + \beta_2 Age_{i,t-1} + \beta_3 Size_{i,t-1} + \beta_4 Return_{i,t-1} + \\ & \beta_5 Invest_{i,t-1} + \beta_6 Leverage_{i,t-1} + \beta_7 Cash_{i,t-1} + \Sigma Industry\ Effects + \\ & \Sigma Year\ Effects + \varepsilon_{i,t} \end{aligned} \quad (1)$$

Invest refers to total new investments in fixed assets, intangibles, other long-term assets, and acquisition expenditures, scaled by total assets. *Growth* captures growth opportunities, measured by percentage changes in annual sales. *Age* is the natural logarithm of the firm's age. *Size* is the natural logarithm of total assets. *Return* indicates the annual return of equity, including dividends reinvested. *Leverage* is the total outside liabilities scaled by total assets. *Cash* represents the total cash as a proportion of total assets. Industry and year fixed effects are included. The residuals obtained from Equation (1) represent investment inefficiency (*Res_Ineff*), where positive residuals indicate overinvestment and negative residuals indicate underinvestment. However, for our analysis purposes, investment efficiency (*Inv_Eff*) is defined as the absolute value of residuals multiplied by -1, so higher *Inv_Eff* values correspond to greater efficiency (Rajkovic, 2020).

4.3.Model specification

¹⁰ The primary findings remain qualitatively unchanged when we limit the analysis to CEOs or Managing Directors, rather than the highest compensated director.

Equation (2) models the relationship between the CEO pay ratio and corporate investment efficiency:

$$\begin{aligned}
Inv_Eff_{i,t+1} = & \beta_0 + \beta_1 Pay_Ratio_{i,t} + \beta_2 CEO_Duality_{i,t} + \beta_3 Promoter_CEO_{i,t} + \\
& \beta_4 Indep_Dir_{i,t} + \beta_5 LEV_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Size_{i,t} + \beta_8 PPE_{i,t} + \beta_9 Loss_{i,t} + \\
& \beta_{10} Age_{i,t} + \beta_{11} Cash_{i,t} + \beta_{12} Sales_{i,t} + \Sigma Industry\ Effects + \Sigma Year\ Effects + \varepsilon_{i,t+1}
\end{aligned}
\tag{2}$$

subscripts denote firm i in year t . The primary variable of interest, *Pay_Ratio*, is the natural logarithm of the CEO's remuneration divided by the median employee's remuneration. We use the natural logarithm of the CEO pay ratio to mitigate right-skewness and outlier influence, improve OLS estimation properties, enable elasticity-like interpretation, and maintain consistency with prior literature (Boone et al., 2024; Nagar & Arya, 2025; Rouen, 2020). The corporate governance controls include *CEO_Duality* (1 if the CEO also serves as board chair), *Promoter_CEO* (1 if the CEO is a promoter or founder), and *Indep_Dir* (the proportion of independent directors on the board). The financial controls include *LEV* (ujtotal outside liabilities scaled by total assets), *ROA* (profit before extraordinary items divided by total assets), *Size* (natural logarithm of total assets), *PPE* (net property, plant, and equipment scaled by total assets), *Loss* (1 if firm reports negative profit), *Age* (one plus natural logarithm of firm's years since listing), *Cash* (total cash scaled by total assets), and *Sales* (total sales scaled by total assets). Industries are classified using the first two digits of the National Industry Classification (NIC) codes. Industry and year fixed effects controls for unobserved heterogeneity. Robust standard errors are clustered at the firm level.

5. Sample selection and descriptive statistics

Our sample includes publicly listed Indian companies covering the period from 2015 to 2023. Data on CEO pay ratio, investment efficiency, and control variables are sourced from the CMIE Prowess database. This database is widely recognized in academic research for obtaining firm-level financial data in the Indian context (Bertrand et al., 2002; Manikandan & Ramachandran, 2015). Our sample period begins after the mandate to disclose the CEO-to-median employee pay ratio on April 1, 2014. The dataset initially comprised all listed non-financial firms. After excluding observations with missing financial variables, the final sample for the primary analysis consists of 10,566 firm-year observations from 2,071 unique firms.¹¹ We winsorized all continuous variables at the 1st and 99th percentiles to mitigate the influence of extreme outliers.

Table 1 summarizes descriptive statistics for the primary variables used in our empirical analysis. The mean (median) pay ratio is 97.89 (42.3), indicating a significantly right-skewed distribution, consistent with Nagar and Arya (2025). Investment efficiency has a mean (median) value of -0.061 (-0.035). On average, 42.4% of CEOs are board chairpersons, 39% are promoter-directors, and over 51% of the board members are independent directors. Financially, firms have an average leverage of 52%, an ROA of 4.4%, and 18.2% of firm-year observations report losses.

<<< Insert Table 1 here >>>

Table 2 presents the correlation matrix. The CEO Pay ratio (*Pay_Ratio*) is negative and significantly correlated with investment efficiency (*Inv_Eff*), suggesting that firms with greater pay disparity show suboptimal investment behavior. Investment efficiency is positively correlated with the presence of promoter-CEOs, higher leverage (*LEV*), and greater asset tangibility (*PPE*). On the other hand, they are negatively correlated with firm size (*Size*),

¹¹ Table A2 in the appendix reports the year-wise distribution of sample firms and their average CEO pay ratios.

profitability (*ROA*), and cash holdings (*Cash*). We also address concerns about multicollinearity among the explanatory variables using the variance inflation factor (VIF) tests, all of which are below the widely accepted threshold of 10, indicating that multicollinearity is not a significant concern.¹²

<<< Insert Table 2 here >>>

Figure 1 shows that firms with higher CEO pay ratios tend to exhibit lower investment efficiency. The marked decrease in average investment efficiency within the top decile of pay ratios underscores the strong relationship with extreme pay inequality.

<<< Insert Figure 1 here >>>

6. Empirical results

6.1. Main results

Table 3 presents the multivariate OLS regression results investigating the relationship between the CEO pay ratio and investment efficiency. Consistent with the managerial rent extraction hypothesis, the baseline models 1 and 2 show a significant negative association between the CEO pay ratio (*Pay_Ratio*) and one-year-ahead investment efficiency (*Inv_Eff_{t+1}*). In terms of economic significance, we find that a one-standard-deviation increase in the pay ratio reduces investment efficiency by 6.49% ($-0.005 \times 1.025 / 0.079$).

<<< Insert Table 3 here >>>

The control variables also appear to be consistent with those in the literature (Benlemlih & Bitar, 2018). For example, larger firms (*Size*) and higher profitability (*ROA*) exhibit lower investment efficiency, possibly due to limited growth opportunities and surplus free cash flows,

¹² Table A3 in the appendix presents the VIFs for the explanatory variables used in the baseline model.

respectively. Consistent with Jensen (1986), we also find that higher leverage (*LEV*) serves as a monitoring mechanism, thereby improving investment efficiency.

In summary, larger CEO-to-median employee pay gaps are linked to reduced investment efficiency. Our findings align with those of Bebchuk et al. (2010), Grinstein and Hribar (2004), and Hoi et al. (2019), suggesting that higher CEO pay disparities are merely a reflection of managers leveraging their influence over compensation designs, rather than managerial talent or optimal contracting.

6.2. Robustness tests

6.2.1. Instrumental variable approach

We employ a two-stage least squares regression to address potential endogeneity concerns arising from reverse causality and simultaneity. Following Bebchuk et al. (2011) and Ertugrul et al. (2017), we use two instruments: the annual industry-median CEO pay ratio (*Ind_Med_Pay_Ratio*) and a location-based annual average CEO pay ratio (*Local_Pay_Ratio*), constructed using the first two digits of the firm's headquarters ZIP code. Since industry- and region-level compensation measures may reflect broader economic conditions such as technological intensity, growth opportunities, or labor market characteristics, our specifications include industry and year fixed effects, which absorb time-invariant industry characteristics and common macroeconomic shocks. We further employ lagged values of the instruments to reduce contemporaneous correlations with firm-level investment decisions (Wu & Zhang, 2025).

The first-stage regression results in Column (1) of Table 4 show that both the instruments are positive and significant, indicating a strong correlation with the CEO pay ratio. The *Kleibergen-Paap rk LM* statistic ($\chi^2 = 215.19, p < 0.01$) rejects underidentification, and both the *Cragg-Donald Wald F* statistic (195.07) and the *Kleibergen-Paap rk Wald F* statistic (144.77) are well

above the *Stock-Yogo* critical value of 19.93, indicating that instruments are strong and valid. The *Hansen-J* test for overidentification ($\chi^2 = 0.11, p = 0.74$) suggests that the instruments are valid and exogenous. Lastly, the *Durbin-Wu-Hausman* endogeneity test ($\chi^2 = 3.929, p = 0.048$) confirms that *Pay_Ratio* is endogenous, justifying the use of the IV approach. The second-stage regression results presented in Column (2) show that the predicted *Pay_Ratio* is negative and statistically significant at the 1% level, supporting our baseline finding.

<<< Insert Table 4 here >>>

6.2.2. Accounting for sample selection bias

We address potential sample selection bias using the Heckman two-stage estimation procedure, recognizing that the CEO pay ratio is not random.¹³ In the first stage, we estimate a probit model of the likelihood that a firm discloses its pay ratio and is included in the primary analysis. The dependent variable (*Inclusion_dummy*) equals 1 for firm-year observations included in Table 3 and 0 otherwise. Following Luo et al. (2025), we include the lagged *Inclusion_dummy* as an explanatory variable to capture persistence in pay ratio disclosure, along with all baseline control variables. The first-stage results in Column (3) of Table 4 generate the Inverse Mills Ratio (IMR), which is included as an additional control in the second-stage regression reported in Column (4). *Pay_Ratio* remains significantly negative at the 1% level, reinforcing the baseline finding.

6.2.3. Omitted variable bias

¹³ In India, disclosure of the CEO-to-median employee pay ratio remains inconsistent across firms. Few promoter-owned firms either omit the disclosure or report it irregularly. This selective disclosure introduces potential sample selection bias, as firms with available pay ratio data may not be representative of the entire population of listed firms. Thus, the Heckman two-step estimation procedure is required to address the concern.

We apply Oster's (2019) sensitivity analysis to assess the potential influence of unobservable factors, quantifying how strongly unobserved variables would need to be to invalidate baseline results. Assuming the R^2 of the model increases by at most 1.3 times the baseline level and the selection on unobservables equals selection on observables ($\delta = 1$), the "true" range of the β coefficient lies between -0.005 and -0.003, excluding zero and falling within the 99.5% confidence interval of the baseline estimate. The calculated δ of 2.45 suggests that omitted variables would need to be more than twice as influential as observed factors to overturn the results, and the inclusion of industry and year fixed effects further limits the scope for omitted variable bias.¹⁴

6.2.4. Generalized methods of moments (GMM) estimation

We further account for potential simultaneity and dynamic endogeneity using the GMM model specified by Blundell and Bond (1998). The diagnostic tests indicate that the model is well specified: the AR(1) test is significant ($p = 0.000$), the AR(2) test is insignificant ($p = 0.508$), and the Hansen overidentification test is insignificant ($p = 0.506$), confirming no second-order serial correlation and valid instruments. The results in Column (5) of Table 4 show that the negative association of CEO pay ratio on corporate investment efficiency persists after accounting for sequential correlation, reinforcing the robustness of our findings.

6.2.5. Difference-in-Difference analysis

We exploit the Companies (Amendment) Act, 2017, which eliminated the mandatory government approval requirement for managerial remuneration exceeding statutory limits, effective from September 2018, to provide causal evidence. Prior to this amendment, firms paying their CEO above 5% of net profits (for profit-making firms) or above the Schedule V

¹⁴ Consistent with Oster's (2019) recommendation, we set the maximum R^2 of the model to be 1.3 times more than the observed R^2 . Our results yielding qualitatively similar inferences when assuming R_{max} values to be 1.5 or 1.7 times than the observed R^2 .

capital-based limits (for loss-making firms) were required to obtain government approval, which is an external regulatory constraint on rent extraction. This constraint was replaced by a shareholder resolution allowing promoter-managers to vote on their own remuneration, rendering the constraint effectively non-binding for entrenched managers.

We exploit this regulatory shock in the form of a relaxation of pay-setting constraints using a difference-in-differences (DiD) design. Treated firms are those that paid their CEO above the statutory limits in any pre-2019 year, while control firms remained within statutory limits throughout the pre-amendment period. The DiD coefficient ($DiD = Treated_i \times Post_t$) captures the differential change in investment efficiency between treated and control firms following the amendment, where $Post = 1$ for fiscal years 2019 onwards. Formally, we estimate:

$$Inv_Eff_{i,t+1} = \beta_0 + \beta_1(Treated_i \times Post_t) + \beta(Controls_{i,t}) + \Sigma Firm\ Effects + \Sigma Year\ Effects + \varepsilon_{i,t+1} \quad (3)$$

The results from Column (6) of Table 4 show that the DiD coefficient is negative and significant, suggesting that firms previously constrained by statutory remuneration limits exhibit significantly lower investment efficiency following the amendment relative to control firms. These results are consistent with the rent extraction hypothesis that deregulation of pay-setting appears to have facilitated greater managerial discretion over compensation, with adverse consequences for capital allocation.

Lastly, we improve covariate balance between treatment and control firms using the entropy balancing approach, which reweights control observations to match treated firms on pre-treatment characteristics, reducing selection bias in the DiD estimate (Hainmueller, 2012). The results presented in Column (7) of Table 4 are consistent with our prior findings.

6.3. Alternate estimators

We conduct robustness checks using alternative estimators and measures of both the dependent and independent variables. First, following Badertscher et al. (2013) and Chen et al. (2007), we proxy investment efficiency by the sensitivity of investment expenditure to growth opportunities. This procedure reflects the firm's adjustments in response to its growth prospects. We interact sales growth (*Growth*) with the CEO pay ratio (*Pay_Ratio*) to assess how pay disparity affects investment responsiveness. Results in Table 5, Column (1) show a negative and significant interaction, indicating that firms with higher CEO pay ratios adjust investment expenditures less in response to growth opportunities.

Second, we adopt Biddle et al. (2009) approach, estimating investment expenditure as a function of lagged sales growth with industry and year fixed effects. Investment efficiency is measured as the negative absolute residuals. Results in Column (2) align with the baseline findings, with a one-standard-deviation increase in pay ratio associated with a 6.45% decline in investment efficiency ($-0.009 \times 1.025 / 0.143$).

<<< Insert Table 5 here >>>

Third, we analyze the actual residual values from Equation (1) to directly assess how the CEO pay ratio relates to investment inefficiency levels. First, it allows a more straightforward interpretation compared to Table 3, where investment inefficiency is represented through a non-linear transformation. Second, Chen et al. (2018) assert that employing the residuals from the first stage regression as the dependent variable may yield biased coefficients and incorrect standard errors in the second stage. A potential solution proposed by Chen et al. (2018) is “to regress the residual from a first-step regression on the combination of all the second-step regressors and all the first-step regressors” (pg. 782). Specifically, we add *Return*, *Growth*, and *Invest*, while other variables from the first-stage regression, such as *LEV*, *Size*, *Age*, and *Cash*, are already included in the second-stage regression. In line with our primary findings, we

anticipate a positive and significant association between the two variables, supporting the managerial rent extraction hypothesis. Column (3) reports a positive and significant result for *Pay_Ratio* at the 1% level. This supports the view that executives may engage in overinvestment to enhance short-term gains. Finally, to account for industry-level pay norms, we scale the CEO pay ratio by the industry median using two-digit NIC codes (Albuquerque et al., 2013). Results in Column (4) remain consistent with our baseline estimates.

6.4. Overinvestment and underinvestment

We next examine whether the association between pay disparity and investment efficiency differs across overinvestment and underinvestment. Using residuals from Equation (1), positive residuals indicate overinvestment and negative residuals indicate underinvestment. Columns (5) and (6) of Table 5 show that a statistically significant negative association between the CEO pay ratio and investment efficiency in both subsamples. The effect is stronger in the overinvestment sample, suggesting that pay disparity exacerbates excessive investment beyond optimal levels. The negative association in the underinvestment sample indicates that highly compensated CEOs may forgo positive net present value projects, consistent with reputational and career concerns (Eisdorfer et al., 2013).

7. Mechanism analysis

This section examines the mechanisms underlying the negative association between the CEO pay ratio and investment efficiency, and the results are reported in Table 6.

Corporate risk-taking plays a vital role in driving long-term growth and maximizing shareholder wealth (Guay, 1999). While risk-averse managers may lead to underinvestment, large pay gaps and performance-based incentives can encourage CEOs to pursue excessively risky or short-term projects to justify high compensation (Bebchuk & Fried, 2004; Eisdorfer et

al., 2013). We measure firm-level risk-taking as the standard deviation of industry-adjusted return on assets (*ROA*) over a rolling five-year window ending in year *t-1* (John et al., 2008). Firms above (below) the industry-year median are classified as high-risk (low-risk) firms. As shown in Column (1), the interaction between *Pay_Ratio* and *High_Risk* is associated with a larger decline in investment efficiency relative to firms facing lower risk. Similarly, we classify firms into high-variable (low-variable) pay groups based on the annual industry median of the variable component as a proportion of total CEO compensation. On average, the variable component accounts for approximately 41% of total CEO remuneration in the high-variable pay subsample, compared to only 1.5% in the low-variable group. Column (2) shows that the negative effect is stronger among firms with a higher share of variable CEO compensation, suggesting that short-term incentives amplify inefficient investment.

<<< Insert Table 6 here >>>

We next examine governance quality using board and CEO busyness as proxies for monitoring effectiveness. While outside directorships may reflect CEO ability and reputation rather than weak monitoring (Fama & Jensen, 1983), Ferris et al. (2003) predict that multiple external appointments reduce monitoring attention, allowing managers to undertake projects that are detrimental to shareholders. In our sample, around two-thirds of CEOs hold external board positions with an average of 3.93 directorships, pervasive enough to impair monitoring quality rather than merely signal reputation. This mechanism is particularly relevant in the Indian context, as multiple directorships dilute monitoring attention and are associated with lower accounting conservatism (Sharma & Kaur, 2021), decreased corporate risk disclosures (Khandelwal et al., 2020), and negative firm value (Pandey et al., 2015). Following Ferris et al. (2003), we classify firms as *High_Busy* if the average number of outside directorships held by independent directors exceeds the industry-year median. Column (3) shows that the

interaction between *Pay_Ratio* and *High_Busy* is negatively associated with investment efficiency. Results in Column (4) indicate that CEO connectedness, when combined with pay ratios, is associated with lower investment efficiency. The positive coefficient on the busyness indicators, alongside a negative interaction with *Pay_Ratio*, suggests that director or CEO busyness captures reputation effects in isolation but weakens monitoring in the presence of higher pay disparity.¹⁵

Overall, these findings suggest that the adverse effect of CEO pay disparity on investment efficiency is consistent with the rent extraction argument, operating through excessive risk taking, short-term compensation incentives, and reduced board monitoring.

8. Additional analysis

8.1. Heterogeneity analysis

The results of the heterogeneity analysis are provided in Table 7.

<<< Insert Table 7 here >>>

8.1.1. Myopic behavior

Myopic managers may prioritize immediate profits over long-term wealth creation (Stein, 1988, 1989), leading them to underinvest in long-horizon projects such as R&D (Narayanan, 1985). We proxy firms' long-term orientation using annual industry-median R&D intensity. Columns (1) and (2) of Panel A show that the negative association between pay disparity and investment efficiency is significant only among low R&D intensive firms, consistent with managerial myopia.

¹⁵ Results using alternative measures of director busyness yield similar inferences (untabulated).

8.1.2. Institutional monitoring

Institutional investors play an important monitoring role by reducing information asymmetry and disciplining managers (Gillan & Starks, 2000). We proxy institutional monitoring using institutional shareholding and classify firms based on the annual industry median values. Columns (3) and (4) of Panel A indicate that the negative association between pay disparity and investment efficiency is present only in firms with lower levels of institutional monitoring.

8.1.3. Justified vs unjustified CEO pay

In this analysis, we decompose the CEO pay ratio into economically justified and unjustified components. While prior studies, including Bao et al. (2020) and Rouen (2020), decompose pay disparity into explained and unexplained components, we build on this approach by explicitly linking these components to real investment outcomes. First, we regress CEO pay on firm-level economic variables specified in Equation 2 (Rouen, 2020). The fitted values represent the explained component, and the residuals indicate the unexplained component. We then use median employee compensation reported by the company to calculate the economically justified pay ratio (EPR) and the unjustified pay ratio (UPR). As EPR and UPR are highly skewed and contain zero or negative values, we employ the inverse hyperbolic sine transformation (Liu et al., 2021). It allows interpretation analogous to logarithmic transformations while accommodating such values. Columns (5) and (6) of Panel A reveal that the explained pay ratios positively associate with investment efficiency, suggesting that compensation aligned with firm fundamentals supports capital allocation. In contrast, the unexplained pay ratio negatively affects investment efficiency, thereby providing direct evidence on the allocation consequences of rent extraction.

8.1.4. Power distance

Power distance refers to the uneven power distribution among members of a certain society, group, or organization (Hofstede, 2001). CEOs with a low power distance index pursue shared power and equality, whereas CEOs with a high power distance index accept inequality as the basis of societal order and work to accentuate their position and authority, enabling them to pursue self-interest projects against wealth maximization. Following Burns et al. (2017) and Tosi and Greckhamer (2004), we use the *executive pay gap* and the *CEO-to-worker pay gap* as proxies of within-firm power distance culture. Burns et al. (2017) find that CEO tournament structure is reflective of the strength of the power structure in the society as well as the extent to which individual needs are considered more important than group needs.

The results reported in Columns (7) to (10) of Panel A reveal that the negative association between pay dispersion and investment efficiency is concentrated in high power distance subgroups, while absent in low power distance subgroups. Thus, the concentration of hierarchical power at the top, rather than pay dispersion per se, enables managerial rent extraction at the expense of investment efficiency (Loi et al., 2023).¹⁶

8.1.5. Family-owned vs. family-managed firms

Firms in emerging economies such as India have a high degree of family involvement through family ownership (Carney, 2005). Though family ownership reduces the traditional principal-agent conflict (Schulze et al., 2001), majority shareholders may pursue self-interest goals at the expense of minority shareholders (Dharwadkar et al., 2000), making it important to examine how the CEO pay ratio relates to investment efficiency across different forms of family control and involvement.

¹⁶ Our results do not qualitatively differ when measuring the *executive pay gap* as total CEO compensation minus the mean total compensation of the top four non-CEO executives.

The results in Columns (1) to (8) of Panel B reveal nuanced patterns. Both family-controlled and non-family-controlled firms show a significant negative association between the CEO pay ratio and investment efficiency, suggesting that the negative effect of pay dispersion on investment efficiency is not exclusively a family ownership phenomenon but persists broadly across ownership structures. A clearer distinction emerges when examining family management. Columns (3) and (4) show that the negative association is significant only among non-family-managed firms, while family-managed firms do not exhibit this pattern. This pattern is intuitive, as family managers, with reputational and socio-emotional wealth at stake, are less likely to engage in rent extraction through excessive pay dispersion, and their less bureaucratic decision-making may better align compensation with firm performance (Arregle et al., 2024; Li et al., 2024). When family ownership and management are considered jointly in Columns (5) to (8), the negative association is driven by family-controlled but non-family-managed firms, where the separation of ownership and management reintroduces agency conflicts despite concentrated ownership (Fama & Jensen, 1983).

Columns (9) and (10) classify firms by business group affiliation. A business group (BG) is a constellation of firms sharing a collective corporate entity generally governed by controlling shareholders, and BG firms in India constitute around 60% of the total market capitalization (Jادیyappa et al., 2022). The negative effect is significant only among small BG affiliates and standalone firms, as large BG affiliate firms benefit from higher institutional monitoring, lower CEO duality, and more justified CEO pay, collectively constraining rent extraction.

Overall, these findings suggest that the CEO pay ratio carries different economic meaning across institutional settings and is more indicative of rent extraction in high power distance and non-family-managed firms.

8.2.CEO pay ratio and labor investment efficiency

We examine whether the executive-employee pay disparity reflects managerial talent or inequity aversion using labor investment efficiency, a dimension less directly tied to short-term firm value and managerial capital allocation incentives, and is more likely to reflect employee responses to organizational practices. Employees concerned about pay fairness may increase shirking and turnover (Cowherd & Levine, 1992), while talent assignment argues a positive association between pay disparity and labor investment efficiency (Li et al., 2024; Rosen, 1981, 1982). Following Jung et al. (2014), we measure labor investment efficiency as a firm's abnormal net hiring, the difference between the actual and the expected change in a firm's labor force based on fundamental economic factors.

The results in Table 8 show that pay disparity is positively associated with labor investment efficiency. However, this positive association is significant only among firms paying above industry-year median employee pay and among firms exhibiting a pay ratio less than the industry norms. These results suggest that talent assignment effects operate only when employee compensation meets a minimum fairness threshold, consistent with conditional tournament incentives rather than unconditional pay hierarchy benefits. Taken together, these findings show that pay disparity is linked to inefficient capital investment, while its effect on labor investment efficiency depends on employee pay, indicating different managerial incentives across investment decisions.

<<< Insert Table 8 here >>>

8.3. Real effects of the pay ratio and investment efficiency

Finally, we examine whether the CEO pay ratio has real performance implications conditional on investment efficiency. Firms are split based on the industry-year median level of investment efficiency. We use two-year and three-year ahead return on assets (ROA) and return on invested

capital (ROIC) as measures of future firm performance.¹⁷ The results reported in Table 9 demonstrate a positive association between the pay ratio and future firm performance for firms with higher investment efficiency.¹⁸ This finding suggests that pay disparity can enhance firm performance when capital allocation decisions are efficient.

<<< Insert Table 9 here >>>

9. Conclusion

This study examines the relation between the CEO pay ratio and corporate investment efficiency. The results show that the CEO pay ratio is negatively associated with investment efficiency, inconsistent with optimal contracting or managerial talent explanations and instead suggestive of managerial rent extraction behavior aimed at empire-building, reputation concerns, or job security. This adverse association is strengthened under conditions of higher managerial risk-taking, greater reliance on variable pay, and weaker board monitoring. The explained component of the CEO pay ratio enhances investment efficiency while the unexplained component reduces it, and long-horizon managers and stronger external monitoring mitigate the adverse relationship. Rent extraction concerns are more pronounced in firms with higher tolerance for hierarchical inequality and weaker family involvement in governance.

The pay ratio is positively associated with labor investment efficiency when employee pay is above industry norms, and the CEO pay ratio is below peer levels, indicating that labor responses to pay disparity are conditional on fairness considerations. This asymmetric pattern, inefficient capital allocation alongside conditionally efficient labor investment, supports the

¹⁷ Regier (2023) documents that the duration of executive compensation is positively related to firms' investment efficiency. Consistent with this evidence, we extend our analysis to examine the long-term operating performance of firms with higher investment efficiency and larger CEO pay ratios.

¹⁸ For simplicity, we employed the same control variables as specified in Equation (2).

rent extraction view rather than a talent-based explanation. Lastly, pay disparity is positively associated with future operating performance only among firms that exhibit higher investment efficiency.

The findings carry important implications for regulators, managers, investors, and policymakers. Regulators may consider linking changes in executive pay to median employee compensation, thereby limiting excessive vertical pay disparity while preserving flexibility in pay setting. A greater scrutiny of short-term and performance-based executive incentives is warranted, as such incentives are associated with myopic investment behavior. Encouraging longer vesting horizons and deferred compensation may help align executive actions with long-term firm value and stakeholder interests. Managers should account for employee pay levels relative to industry norms when setting executive compensation, as high pay ratios combined with below-industry employee pay may increase shirking and turnover, undermining investment efficiency. Investors should evaluate CEO pay ratios alongside governance quality and monitoring mechanisms, rather than in isolation, as high pay disparity coupled with weak internal governance may signal elevated risks of rent extraction and inefficient investment, whereas strong oversight can mitigate these risks. Finally, policymakers may use CEO pay ratio disclosures as a screening tool to identify firms where excessive pay disparity coincides with weak governance, enabling targeted oversight rather than uniform regulatory intervention.

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Table 1: Descriptive Statistics

	Mean	SD	Min	p25	Median	p75	Max
Inv_Eff _{t+1}	-0.061	0.079	-0.480	-0.068	-0.035	-0.018	-0.001
Pay_Ratio	3.945	1.025	2.435	3.157	3.768	4.561	7.045
CEO_Duality	0.424	0.494	0.000	0.000	0.000	1.000	1.000
Promoter_CEO	0.390	0.488	0.000	0.000	0.000	1.000	1.000
Indep_Dir	0.516	0.094	0.286	0.467	0.500	0.571	0.750
LEV	0.522	0.231	0.090	0.354	0.515	0.665	1.348
ROA	0.044	0.070	-0.198	0.009	0.039	0.081	0.246
Size	8.724	1.826	4.943	7.382	8.647	9.969	13.045
PPE	0.290	0.185	0.006	0.139	0.271	0.416	0.777
Loss	0.182	0.386	0.000	0.000	0.000	0.000	1.000
Age	2.913	0.737	1.099	2.485	3.178	3.434	3.761
Cash	0.060	0.083	0.001	0.011	0.028	0.070	0.443
Sales	1.049	0.672	0.073	0.611	0.932	1.326	3.803
<i>N</i>	10,566						
This table presents descriptive statistics for variables in baseline regression. Detailed variable definitions are provided in Table A1.							

Table 2: Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Inv_Eff _{t+1}	1.000												
(2) Pay_Ratio	-0.094*	1.000											
(3) CEO_Duality	0.023	0.086*	1.000										
(4) Promoter_CEO	0.049*	0.046*	0.249*	1.000									
(5) Indep_Dir	0.013	0.080*	0.156*	0.086*	1.000								
(6) LEV	0.168*	-0.057*	0.000	-0.051*	0.007	1.000							
(7) ROA	-0.146*	0.204*	0.005	0.012	-0.021	-0.514*	1.000						
(8) Size	-0.074*	0.530*	-0.012	-0.013	0.065*	0.080*	0.115*	1.000					
(9) PPE	0.053*	0.091*	0.055*	0.057*	0.006	0.151*	-0.160*	-0.011	1.000				
(10) Loss	0.053*	-0.135*	-0.024	-0.023	0.026*	0.369*	-0.655*	-0.046*	0.125*	1.000			
(11) Age	-0.011	0.054*	-0.017	0.010	0.077*	0.011	0.003	0.130*	0.074*	0.021	1.000		
(12) Cash	-0.108*	-0.026*	-0.082*	-0.075*	-0.054*	-0.290*	0.307*	0.014	-0.273*	-0.140*	0.018	1.000	
(13) Sales	0.003	-0.043*	-0.008	0.013	-0.035*	0.013	0.252*	-0.256*	-0.087*	-0.226*	-0.032*	0.023	1.000

This table presents the correlation matrix for variables in the baseline regression. Detailed variable definitions are provided in Table A1. * indicates statistical significance at the 5% or 1% levels.

Table 3: CEO pay ratio and investment efficiency

	(1) Inv_Eff _{t+1}	(2) Inv_Eff _{t+1}
Pay_Ratio	-0.008*** (-5.80)	-0.005*** (-3.03)
CEO_Duality		0.001 (0.39)
Promoter_CEO		0.008*** (3.74)
Indep_Dir		0.013 (1.11)
LEV		0.044*** (6.84)
ROA		-0.103*** (-3.86)
Size		-0.002*** (-2.69)
PPE		0.005 (0.74)
Loss		-0.014*** (-4.38)
Age		-0.002 (-1.00)
Cash		-0.023 (-1.47)
Sales		0.000 (0.08)
Constant	-0.028** (-2.42)	-0.049*** (-3.26)
Industry FE	Yes	Yes
Year FE	Yes	Yes
<i>N</i>	10,566	10,566
adj. <i>R</i> ²	0.031	0.064

This table presents the regression results of the effect of pay ratio on investment efficiency. Standard errors are clustered at the firm level. Detailed variable definitions are provided in Table A1. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4: Robustness tests

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	2SLS regression		Heckman two-stage regression		GMM	DiD	EB-DiD
	First Stage	Second Stage	First Stage	Second Stage			
	Pay_Ratio	Inv_Eff _{t+1}	Inclusion_dummy	Inv_Eff _{t+1}	Inv_Eff _{t+1}	Inv_Eff _{t+1}	Inv_Eff _{t+1}
Pay_Ratio	-	-0.012*** (-3.02)	-	-0.005*** (-3.08)	-0.003*** (-2.61)	-	-
DID	-	-	-	-	-	-0.008** (-1.99)	-0.008** (-2.24)
Local_Pay_Ratio	0.679*** (10.80)	-	-	-	-	-	-
Ind_Med_Pay_Ratio	0.360*** (4.10)	-	-	-	-	-	-
Inclusion_dummy _{t-1}	-	-	1.945*** (68.39)	-	-	-	-
IMR	-	-	-	-0.004** (-2.03)	-	-	-
Inv_Eff _t	-	-	-	-	0.254** (2.25)	-	-
CEO_Duality	0.144*** (4.68)	0.002 (1.19)	0.051** (2.17)	0.001 (0.34)	0.001 (0.48)	-0.002 (-0.70)	-0.002 (-0.93)
Promoter_CEO	0.021 (0.70)	0.008*** (5.24)	0.215*** (8.58)	0.007*** (3.44)	0.003* (1.73)	0.002 (0.80)	0.001 (0.57)
Indep_Dir	0.389*** (2.80)	0.016* (1.96)	0.443*** (4.21)	0.012 (0.97)	0.010 (1.13)	0.005 (0.39)	0.010 (0.84)
LEV	-0.272*** (-3.43)	0.042*** (9.07)	-0.312*** (-9.80)	0.045*** (6.98)	0.037*** (5.27)	0.025** (2.31)	0.023** (2.16)
ROA	1.474*** (4.98)	-0.092*** (-4.56)	0.979*** (8.03)	-0.104*** (-3.90)	-0.044* (-1.84)	-0.022 (-0.84)	-0.024 (-0.87)
Size	0.293*** (28.28)	0.000 (0.00)	0.148*** (21.82)	-0.003*** (-3.02)	-0.002** (-2.53)	0.003 (0.82)	0.004 (0.87)
PPE	0.445*** (4.70)	0.009* (1.66)	0.356*** (5.62)	0.004 (0.61)	0.009 (1.64)	0.029** (2.05)	0.032** (2.26)
Loss	-0.031 (-0.79)	-0.014*** (-5.69)	-0.156*** (-5.22)	-0.013*** (-4.28)	-0.006** (-2.22)	-0.001 (-0.28)	-0.002 (-0.56)
Age	-0.035* (-1.67)	-0.002* (-1.77)	0.035*** (3.13)	-0.002 (-1.24)	-0.001 (-0.61)	0.004 (0.43)	-0.004 (-0.44)
Cash	-0.543*** (-2.94)	-0.028** (-2.30)	-0.249** (-1.98)	-0.023 (-1.44)	-0.027* (-1.85)	-0.043* (-1.87)	-0.050** (-2.07)
Sales	0.099*** (3.45)	0.001 (0.65)	0.071*** (4.57)	-0.000 (-0.03)	-0.003 (-1.40)	0.000 (0.01)	0.001 (0.14)
Constant	-2.874*** (-6.37)	-0.041*** (-3.53)	-1.979*** (-15.31)	-0.039** (-2.42)	-0.028*** (-2.68)	-0.119*** (-2.71)	-0.102** (-2.30)
Industry FE	Yes	Yes	Yes	Yes	-	-	-
Firm FE	-	-	-	-	-	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	10,566	10,566	26,156	10,566	9,885	10,102	8,711
adj. R ² /Pseudo R ²	0.379	0.058	0.445	0.064	-	0.304	0.308

This table presents the results of the robustness analysis. Standard errors are clustered at the firm level. Detailed variable definitions are provided in Table A1. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 5: Alternate estimators

	(1) Investment- growth sensitivity analysis Invest _{t+1}	(2) Biddle et al. (2009) Inv_Eff_Bi ddle _{t+1}	(3) Actual residuals from Equation (1) Res_Ineff _{t+1}	(4) Ind. adj. Pay_Ratio Inv_Eff _{t+1}	(5) Over_Inv Inv_Eff _{t+1}	(6) Under_Inv Inv_Eff _{t+1}
Pay_Ratio	0.016*** (4.44)	-0.009*** (-2.87)	0.004*** (3.08)	-0.004*** (-2.95)	-0.005* (-1.80)	-0.002** (-2.46)
Growth	0.013** (2.39)	-	-0.007** (-2.21)	-	-	-
Growth*Pay_Ratio	-0.005*** (-2.91)	-	-	-	-	-
CEO_Duality	-0.006 (-1.02)	0.003 (0.55)	-0.001 (-0.64)	0.001 (0.37)	0.001 (0.18)	0.001 (0.35)
Promoter_CEO	-0.021*** (-3.90)	0.020*** (4.08)	-0.005*** (-2.66)	0.008*** (3.75)	0.009** (2.27)	0.005*** (3.28)
Indep_Dir	-0.014 (-0.39)	0.015 (0.49)	0.013 (1.02)	0.013 (1.10)	0.024 (1.02)	0.014* (1.85)
LEV	-0.115*** (-6.66)	0.071*** (4.56)	-0.031*** (-4.82)	0.045*** (6.85)	0.058*** (4.43)	0.025*** (6.06)
ROA	0.410*** (5.16)	-0.229*** (-3.10)	0.144*** (4.95)	-0.103*** (-3.88)	-0.118** (-2.37)	-0.034* (-1.72)
Size	0.016*** (6.80)	-0.010*** (-4.86)	0.000 (0.56)	-0.002*** (-2.77)	-0.005*** (-3.03)	-0.001** (-2.27)
PPE	-0.012 (-0.76)	0.064*** (4.99)	-0.008 (-1.43)	0.005 (0.73)	0.036*** (2.74)	-0.006 (-1.23)
Loss	0.023*** (3.01)	-0.036*** (-4.89)	0.008** (2.46)	-0.014*** (-4.39)	-0.026*** (-3.82)	-0.006** (-2.53)
Age	0.002 (0.60)	-0.007** (-2.07)	-0.001 (-0.71)	-0.002 (-0.99)	-0.006** (-2.16)	-0.000 (-0.22)
Cash	-0.074* (-1.88)	0.050 (1.57)	-0.062*** (-3.76)	-0.023 (-1.46)	-0.074** (-2.45)	-0.033*** (-2.80)
Sales	0.008 (1.30)	-0.009 (-1.45)	0.006*** (2.73)	0.000 (0.08)	-0.006 (-1.13)	0.004*** (3.05)
Return	-	-	-0.002 (-1.19)	-	-	-
Invest	-	-	0.069*** (4.31)	-	-	-
Constant	-0.019 (-0.48)	-0.017 (-0.49)	-0.010 (-0.63)	-0.065*** (-4.37)	-0.054* (-1.80)	-0.045*** (-5.09)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	10,566	10,566	10,566	10,566	3,726	6,840
adj. R ²	0.148	0.099	0.023	0.064	0.081	0.053

This table presents the regression results of the alternative estimators. Standard errors are clustered at the firm level. Detailed variable definitions are provided in Table A1. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6: Mechanism analysis

Dependent variable:	(1)	(2)	(3)	(4)
Inv_Eff _{t+1}	Risk Taking	CEO Pay Structure	Indep_Dir Busyness	CEO Connect
Pay_Ratio	-0.002* (-1.68)	-0.000 (-0.16)	-0.002 (-1.07)	-0.002 (-0.87)
High Risk	0.009 (1.17)			
High Risk*Pay_Ratio	-0.004** (-1.98)			
High_Variable		0.026*** (3.18)		
High_Variable*Pay_Ratio		-0.007*** (-3.40)		
High_Busy			0.018** (2.20)	
High_Busy*Pay_Ratio			-0.006*** (-2.71)	
CEO Connect				0.018** (2.04)
CEO Connect*Pay_Ratio				-0.004* (-1.84)
Constant	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
<i>N</i>	10,429	10,414	10,566	10,566
adj. <i>R</i> ²	0.066	0.066	0.065	0.064

This table presents the regression results of the mechanism analysis. Standard errors are clustered at the firm level. Detailed variable definitions are provided in Table A1. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 7: Heterogeneity analysis

Panel A										
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Inv_Eff _{t+1}	R&D Intensity		Insti_Shareholding		Pay Ratio Decomposition		Executive pay gap		CEO-to-worker pay gap	
	High	Low	High	Low	EPR	UPR	High	Low	High	Low
Pay_Ratio	-0.002 (-0.88)	-0.005*** (-3.01)	-0.003 (-1.03)	-0.005** (-2.57)	0.002*** (4.74)	-0.001*** (-5.09)	-0.005** (-2.05)	-0.002 (-1.07)	-0.006** (-2.47)	0.001 (0.24)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	3,495	7,071	3,283	7,283	10,414	10,414	5,322	5,244	5,323	5,243
adj. <i>R</i> ²	0.096	0.063	0.098	0.054	0.066	0.068	0.052	0.088	0.071	0.050
Panel B										
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Inv_Eff _{t+1}	FC=1	FC=0	FM=1	FM=0	FC=1 & FM=1	FC=1 & FM=0	FC=0 & FM=1	FC=0 & FM=0	Large BGs	Small BGs and Standalone
Pay_Ratio	-0.004** (-2.41)	-0.006* (-1.90)	-0.004 (-1.38)	-0.005*** (-2.94)	-0.003 (-1.16)	-0.005** (-2.38)	-0.006 (-0.78)	-0.006* (-1.80)	-0.005 (-1.12)	-0.004*** (-2.64)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	7,633	2,933	2,205	8,361	1,623	6,010	582	2,351	2,192	8,374
adj. <i>R</i> ²	0.067	0.063	0.035	0.069	0.044	0.075	0.041	0.063	0.081	0.061

This table presents the regression results of the heterogeneity analysis. FC refers to family-controlled, while FM refers to family-managed firms. Standard errors are clustered at the firm level. Detailed variable definitions are provided in Table A1. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 8: CEO pay ratio and labor investment efficiency

Dependent variable:	(1)	(2)	(3)	(4)	(5)
Lab Inv Eff _{t+1}	Full Sample	Employee pay		CEO-to-worker pay gap	
		High	Low	High	Low
Pay_Ratio	0.014** (2.42)	0.020** (2.20)	0.005 (0.60)	0.014 (1.50)	0.029* (1.82)
Constant	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
<i>N</i>	9,318	4,765	4,427	4,856	4,462
adj. <i>R</i> ²	0.029	0.039	0.021	0.035	0.027

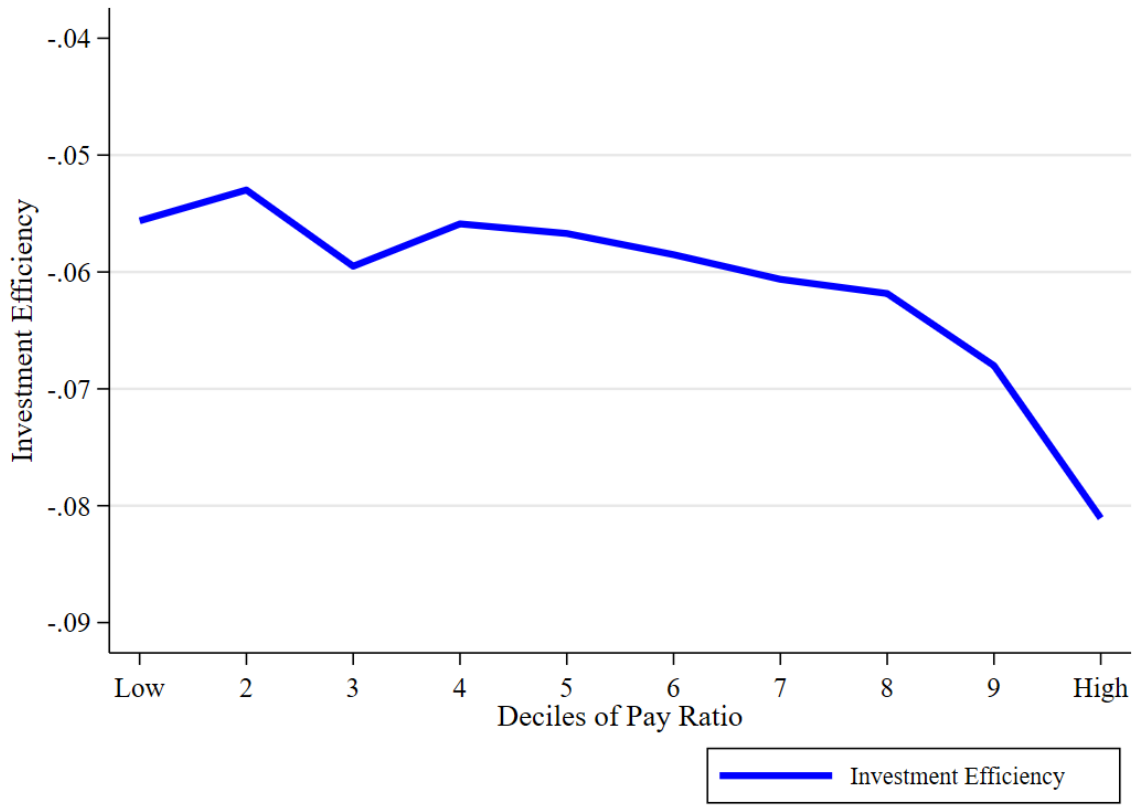
This table presents the regression results of the effect of pay ratio on labor investment efficiency. Standard errors are clustered at the firm level. Detailed variable definitions are provided in Table A1. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 9: Investment efficiency, pay-ratio, and future firm performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ROIC _{t+2}	ROIC _{t+2}	ROA _{t+2}	ROA _{t+2}	ROIC _{t+3}	ROIC _{t+3}	ROA _{t+3}	ROA _{t+3}
	High_Eff	Low_Eff	High_Eff	Low_Eff	High_Eff	Low_Eff	High_Eff	Low_Eff
Pay_Ratio	0.005**	0.002	0.004*	0.002	0.008**	-0.001	0.004**	0.002
	(2.13)	(0.75)	(1.88)	(1.05)	(2.55)	(-0.46)	(2.28)	(1.00)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>N</i>	4,862	4,235	4,862	4,235	4,152	3,606	4,152	3,606
adj. <i>R</i> ²	0.085	0.094	0.183	0.268	0.064	0.081	0.151	0.213

This table presents the regression results examining the relationship between the CEO pay ratio and future firm performance. Standard errors are clustered at the firm level. Detailed variable definitions are provided in Table A1. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Figure 1: CEO pay ratio and investment efficiency



Appendix

Table A1: Variable definitions

Variable	Defintion
<i>Independent variable</i>	
Pay_Ratio	Natural logarithm of the ratio of the highest-paid director's remuneration to the median employee remuneration.
<i>Dependent variable</i>	
Inv_Eff	The absolute value of the residuals, multiplied by -1, is estimated from the investment efficiency model, as described by Richardson (2006).
Res_Ineff	Actual value of the residuals estimated from the investment efficiency model following Richardson (2006).
Invest	Total new investments in fixed assets, intangibles, other long-term assets, and acquisition expenditures, scaled by total assets.
<i>Control variables</i>	
Growth	$(\text{Net Sales}_t - \text{Net Sales}_{t-1}) / \text{Net Sales}_{t-1}$.
Age	Natural logarithm of firm age since listing.
Size	Natural logarithm of total assets.
Return	Annual stock return including cash dividends reinvested.
LEV	Total outside liabilities scaled by total assets.
Cash	Total cash holdings as a percentage of total assets.
CEO_Duality	Indicator variable equal to 1 if the CEO also serves as the board chairperson, and 0 otherwise.
Promoter_CEO	Indicator variable equal to 1 if the CEO is also a promoter director, and 0 otherwise.
ROA	Net profit divided by total assets.
PPE	Net property, plant, and equipment scaled by total assets.
Loss	Indicator variable equal to 1 if the firm reports a negative profit, and 0 otherwise.
Indep_Dir	Proportion of independent directors on the board.
Sales	Total Sales scaled by total assets.
<i>Other variables</i>	
Inv_Eff_Biddle	The absolute value of the residuals, multiplied by -1, is estimated from the investment efficiency model, as described by Biddle et al. (2009).
Ind. Adj. Pay_Ratio	Pay_Ratio adjusted for the annual industry-median Pay_Ratio.
High_Risk	Indicator variable equal to 1 if a firm's five-year rolling standard deviation of industry-adjusted ROA exceeds the annual industry median, and 0 otherwise (John et al., 2008).
High_Variable	Indicator variable equal to 1 if the CEO's variable component exceeds the annual industry median, and 0 otherwise.
High_Busy	Indicator variable equal to 1 if the average directorships held by an independent director exceeds the annual industry median, and 0 otherwise.
CEO_Connect	Indicator variable equal to 1 if the CEO holds directorships in other companies, and 0 otherwise.
R&D Intensity	Research and development expenses/Total assets. High and low groups are defined based on annual industry median values.

Insti Shareholding	Percentage of shareholding by institutional investors. High and low groups are defined based on annual industry median values.
EPR	Economically justified pay ratio, defined as predicted CEO pay from firm-level economic determinants (as specified in Equation (2)) divided by median employee pay.
UPR	Unjustified pay ratio, defined as the residual component of CEO pay from firm-level economic variables (as specified in Equation (2)) divided by median employee pay.
Executive pay gap	The difference between total CEO compensation and the mean total compensation of the top two non-CEO executives scaled by total assets. High and low groups are defined based on annual industry median values.
CEO-to-worker pay gap	CEO pay scaled by median employee pay. High and low groups are defined based on annual industry median values.
FC (Family-controlled firm)	Indicator variable equal to 1 if promoter shareholding exceeds 50% of total equity, and 0 otherwise.
FM (Family-managed firm)	Indicator variable equal to 1 if the CEO is a promoter and at least three promoter directors are present on the board, and 0 otherwise.
Large BGs	Firms classified as large business group affiliates according to the Prowess database.
Small BGs and standalone	Firms classified as small business group affiliates and standalone according to the Prowess database.
Lab_Inv_Eff	The absolute value of the residuals, multiplied by -1, is estimated from the labor investment efficiency model, as described by Jung et al. (2014).
Employee pay	Median employee pay is calculated using the CEO pay ratio disclosed by firms. High and low groups are defined based on annual industry median values.
High_Eff (Low_Eff)	Investment efficiency is higher (lower) than the annual industry median investment efficiency.
ROIC	Return on invested capital - (Net profit + financial expenses) / (total assets – current liabilities + short-term trade payables + short-term borrowings + current maturities of long-term debt).

Table A2: CEO pay ratio classification

Year	N	Mean
2015	869	103.01
2016	1003	98.36
2017	1026	96.65
2018	1084	97.97
2019	1235	95.72
2020	1298	91.64
2021	1295	88.65
2022	1319	109.82

2023	1437	100.15
Total	10,566	97.89

Table A3: Variance inflation factor (VIF)

Variable	VIF	1/VIF
Pay_Ratio	1.53	0.655
CEO_Duality	1.12	0.893
Promoter_CEO	1.09	0.920
Indep_Dir	1.06	0.946
LEV	1.60	0.624
ROA	2.44	0.411
Size	1.71	0.583
PPE	1.44	0.693
Loss	1.81	0.552
Age	1.11	0.903
Cash	1.29	0.777
Sales	1.42	0.705
Industry FE	Yes	
Year FE	Yes	
<i>N</i>	10,566	
Mean VIF	2.83	