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HOW VERTICAL AND HORIZONTAL PAY GAPS IN RESEARCH AND DEVELOPMENT AFFECT CORPORATE INNOVATION IN INDONESIAN PUBLIC FIRMS

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ABSTRACT

This study examines how vertical and horizontal pay disparities influence corporate innovation in publicly listed Indonesian firms from 2018 to 2022. Using a dataset of 1,505 firm-year observations, we apply Social Comparison Theory to analyze how perceived compensation inequalities impact innovation performance, measured by patent filings and citations. To ensure robustness, we employ Ordinary Least Squares (OLS), Two-Stage Least Squares (2SLS), Propensity Score Matching (PSM), Difference-in-Differences (DID), Entropy Balancing, and Tobit Regression. The results indicate that vertical pay disparity (CV_MT-RDP) positively affects patent quantity but negatively impacts patent quality, implying that larger managerial pay gaps encourage more patents but may not enhance their impact. Conversely, horizontal pay disparity (CV_RDP-OE) consistently reduces both patent output and citation impact, demonstrating that excessive pay differences across departments undermine cross-functional collaboration and innovation efficiency. Further, state-owned enterprises (SOEs) experience stronger negative effects of pay disparities on innovation than private firms, reinforcing the role of fairness concerns in shaping employee motivation. These findings suggest that firms should strategically design compensation policies to balance tournament incentives and pay equity to sustain long-term innovation performance.

Keywords: *Corporate innovation, pay gap, R&D incentives, state-owned enterprises, financial compensation, performance-based incentives*

1. INTRODUCTION

Indonesia's commitment to research and development (R&D) remains modest compared to global standards. In 2020, the country's R&D expenditure was approximately 0.28% of its Gross Domestic Product (GDP), which is relatively low compared to other nations such as South Korea, which invests around 4.9% of its GDP in R&D (World Bank, 2024). According to the Global Innovation Index (GII) (2023), Indonesia is ranked 61st among the 132 economies. This marks a significant improvement over previous years, where Indonesia ranked 75th in 2022, 87th in 2021, and 85th in 2020. Despite this progress, Indonesia's position remains modest compared to that of other nations, reflecting its relatively low investment in R&D. This limited investment in R&D contributes to Indonesia's current standing in global innovation rankings.

This improvement indicates significant strides in the country's innovation landscape. Specifically, the rankings for innovation input factors, such as institutional frameworks, infrastructure (Zatonatskiy & Lavrentiev, 2023), and market sophistication, have steadily improved, climbing from 91st in 2020 to 64th in 2023. Similarly, innovation outputs, which measure tangible results such as patents and technological developments, have improved from 76th in 2020 to 63rd in 2023. This positive trajectory suggests that Indonesia has effectively enhanced both the foundational elements required for innovation and its capacity to convert inputs into productive outcomes. Despite these advancements, however, the overall rankings demonstrate that Indonesia's innovation capabilities still lag behind global leaders.

The modest innovation rankings highlight the urgent need to identify internal organizational factors that could significantly boost corporate innovation in Indonesia (Jiuhardi et al., 2022). Prior studies have extensively explored the various determinants of corporate innovation (Manso, 2011), including financial structure (Hausman & Johnston, 2014), corporate governance (Fahlevi et al., 2022), and knowledge management (Chemmanur & Tian, 2012). However, the influence of internal organizational compensation structures, particularly those involving R&D personnel, remains relatively understudied, especially in emerging markets (Chang et al., 2015). To bridge this gap, we propose examining two novel indicators of pay dispersion using the Coefficient of Variation (CV), calculated as the ratio of the standard deviation to mean salary within relevant employee groups. Specifically, we investigate the vertical pay gap, defined as the CV between management and R&D teams (CV_MT-RDP), and the horizontal pay gap between R&D teams and other departmental employees (CV_RDP-OE). Adopting this approach aligns with recent research that suggests that relative dispersion measures more accurately capture perceived compensation inequality and its impact on employee motivation and collaboration (Faleye et al., 2013; Mueller et al., 2017). Analyzing these pay dispersion measures is critical, as R&D personnel are key agents that directly influence firms' innovative outputs, and understanding their motivational environment is essential for enhancing innovation outcomes.

Beyond financial resources alone, internal pay structures significantly shape how R&D personnel perceive their relative value and status within an organization, influencing their willingness to innovate and collaborate effectively (Faleye et al., 2013; Mueller et al., 2017). This study builds upon social comparison theory (Festinger, 1954), which posits that employees assess their organizational standing and compensation fairness by comparing themselves with similar-level colleagues across departments. Unlike absolute compensation levels, perceptions arising from such comparisons directly impact morale, trust, and propensity to engage in innovative and collaborative efforts (Breza et al., 2017; Card et al., 2012; Yusri et al., 2022). Specifically, we hypothesize that a pronounced vertical pay disparity, measured using the coefficient of variation between management and R&D personnel salaries (CV_MT-RDP), could generate negative comparisons, leading R&D personnel to perceive themselves as undervalued compared with management. Such perceptions may demotivate R&D staff and reduce their initiatives toward innovative projects. Furthermore, horizontal pay disparities, represented by the coefficient of variation between R&D personnel and employees from other departments (CV_RDP-OE), may amplify negative social comparisons, impairing cross-departmental collaboration essential for innovation (Shaw, 2015; Trevor et al., 2012; Abdullayeva et al., 2024).

Utilizing comprehensive salary data from publicly listed Indonesian firms, our empirical analysis confirms these hypotheses: both CV-based vertical and horizontal pay disparities negatively correlate with corporate innovation outputs, particularly patent productivity and citation frequency. These negative relationships are notably stronger within state-owned enterprises (SOEs), reflecting heightened sensitivity toward perceived inequalities in organizations with traditionally egalitarian cultures. Additionally, further analysis of industry-level variations un-

derscores that, while a certain level of managerial pay premium could be justified to reward leadership responsibilities, excessively high managerial pay relative to R&D and other departmental salaries can trigger adverse comparisons and significantly disrupt innovation processes.

Unlike previous studies that primarily emphasize monetary incentives at the individual or managerial level as key drivers of corporate innovation (Bobillo et al., 2018; Yang et al., 2022; Xu et al., 2023), our study uniquely underscores the influence of perceived internal pay inequality on innovation performance. Moving beyond absolute compensation levels, we introduce a novel conceptualization of relative pay disparities using the coefficient of variation (CV), which better captures employees' perceptions of pay fairness within organizational hierarchies and across departments. Drawing upon social comparison theory (Festinger, 1954), we argue that innovation emerges not only from direct financial incentives, but also significantly from employees' perceptions of their relative organizational value. Negative comparisons arising from substantial pay disparities can impede collaboration, reduce motivation, and stifle creative initiatives that are essential for innovation (Cullen & Perez-Truglia, 2022). Therefore, our study provides fresh insights by illustrating how both vertical and horizontal pay disparities, as perceived inequities rather than absolute gaps, critically shape innovation outcomes within organizations. By integrating the psychological perspectives of fairness into the economic analyses of corporate innovation, we uncover an underexplored dimension of how internal organizational dynamics fundamentally affect firms' innovative capacities.

Our research addresses this gap by empirically demonstrating that relative pay disparities captured through the coefficient of variation affect innovation not merely by shaping individual behavior but by altering collaboration dynamics and motivational climates across departments. Specifically, our study reveals that perceived vertical pay disparities between management and R&D teams and horizontal pay disparities between R&D and other departmental employees significantly influence corporate innovation by affecting internal collaboration and organizational trust. This expands the application of social comparison theory beyond traditional individual-level analyses, showing how collective perceptions of inequality can substantially shape organizational innovation performance (Gartenberg & Wulf, 2017; Ma et al., 2023; Nickerson & Zenger, 2008). Additionally, our decomposition analysis at the industry level uncovers how managerial pay premiums when excessive can inadvertently trigger negative social comparisons that undermine cooperative behavior essential for innovation, contrasting sharply with conventional economic theories suggesting that such premiums solely serve to mitigate agency problems.

Our findings also have practical implications for the design of effective compensation strategies to enhance innovation. For instance, firms, particularly state-owned enterprises characterized by strong collective and egalitarian norms, should carefully manage horizontal pay disparities across departments to maintain collaborative environments conducive to innovation. Conversely, in private firms with more individualized, market-oriented cultures, modest vertical pay distinctions that clearly reflect contribution differences may motivate innovation without negatively affecting cross-departmental cooperation. Strategically positioning R&D pay within industry benchmarks can help firms leverage relative compensation as a tool for sustaining long-term innovation performance.

2. LITERATURE REVIEW

2. 1. SOCIAL COMPARISON THEORY

Social Comparison Theory was first proposed by Festinger (1954), who argued that individuals possess an inherent drive to evaluate their own abilities, status, and circumstances by comparing themselves to others. These comparisons serve as essential benchmarks for self-evaluation,

particularly when the objective criteria are lacking or unclear. Festinger (1954) highlighted two primary types of social comparisons: upward comparison, which occurs when individuals compare themselves with those perceived as superior, and downward comparison, which involves comparisons with those perceived as inferior. Each type of comparison yields different emotional and behavioral responses; upward comparisons may motivate self-improvement or induce dissatisfaction, whereas downward comparisons might enhance self-esteem or reinforce complacency (Buunk & Gibbons, 2007).

Researchers have expanded the scope of social comparison theory beyond individual self-assessment, applying it to organizational contexts to understand workplace dynamics and employee behaviors (Matthews & Kelemen, 2025; Roelof et al., 2023). Social comparisons regarding compensation within organizations have become a critical area of study, as salary represents a tangible metric for assessing one's organizational value and status relative to peers. Studies in this domain emphasize that employees frequently engage in comparisons with coworkers who occupy similar positions or job roles (Watto et al., 2023). Negative social comparisons resulting from perceived pay inequalities have consistently been shown to decrease job satisfaction, motivation, and overall organizational commitment (Cullen & Perez-Truglia, 2022; Maier et al., 2022).

In the specific context of corporate finance, social comparison theory suggests that perceived fairness or unfairness in compensation not only affects individual motivation, but also significantly shapes group cohesion and cooperative behaviors essential for innovation activities (Nickerson & Zenger, 2008). If R&D personnel perceive their compensation as unfairly low relative to their colleagues in management or other departments, negative comparisons may arise, diminishing motivation, limiting information sharing, and hindering the collaborative processes crucial to innovation success. Conversely, when compensation is perceived as fair or justifiable, positive social comparisons can foster a cooperative culture that enhances creative problem solving, knowledge exchange, and innovation productivity (Gartenberg & Wulf, 2017; Watto et al., 2023).

Hierarchical structures and collectivist cultures can uniquely shape perceptions of compensation (Mushtaq et al., 2022; Ruddin et al., 2020). Thus, applying social comparison theory to analyze pay disparities both vertically (management vs. R&D) and horizontally (R&D vs. other departments) provides valuable insights into how internal perceptions of fairness drive collaborative innovation efforts within firms. This perspective allows us to better understand the indirect psychological mechanisms linking internal financial structures to innovation outcomes, thus contributing a novel theoretical lens to the existing innovation research.

2. 2. VERTICAL PAY DISPARITY BETWEEN MANAGEMENT AND R&D PERSONNEL AND CORPORATE INNOVATION

Corporate innovation depends not only on tangible financial resources but also on intangible motivational factors driven by employees' perceptions of fairness and status within the organization (Ahmad et al., 2023; Alhitmi et al., 2023; Huang et al., 2024). Employees, particularly those in critical innovation roles, such as R&D, frequently assess their value and status within the firm by comparing their compensation relative to management (Lerner & Wulf, 2007; Sauermann & Cohen, 2010). According to social comparison theory (Festinger, 1954), such vertical comparisons significantly influence employees' perceptions of fairness and organizational recognition (Cullen & Perez-Truglia, 2022). When R&D personnel perceive excessive vertical pay disparities relative to top management, feelings of inequity could arise, diminishing motivation and undermining their commitment to innovation activities. This psychological mechanism is particularly relevant in Indonesia, where cultural norms emphasize respect and harmony, causing pronounced sensitivity toward perceived inequities between hierarchical levels within organizations (Pfeifer & Stephan, 2019). Thus, we propose:

H_1**:** *The vertical pay disparity between management and R&D personnel, measured by the coefficient of variation (CV_MT-RDP), negatively affects corporate innovation.*

2. 3. HORIZONTAL PAY DISPARITY BETWEEN R&D PERSONNEL AND EMPLOYEES IN OTHER DEPARTMENTS AND CORPORATE INNOVATION

Innovation within firms also depends significantly on cross-departmental collaboration and collective organizational efforts. Previous studies have highlighted that successful innovation requires strong inter-departmental cohesion, information sharing, and mutual support (Nickerson & Zenger, 2008; Trevor et al., 2012). Social comparison theory underscores that perceived horizontal pay disparity differences in compensation among employees occupying similar hierarchical positions across various departments can negatively influence interpersonal trust, cooperation, and overall organizational morale (Fredrickson et al., 2010; Watto et al., 2023). In Indonesian companies, which are known for their collectivist orientation, horizontal pay inequalities between R&D personnel and peers in other departments could be especially detrimental. Excessive disparities may lead employees to perceive their efforts and contributions as undervalued compared with their colleagues, resulting in reduced motivation, diminished collaboration, and decreased commitment to organizational objectives such as innovation. Thus, we propose:

H_2: The horizontal pay disparity between R&D personnel and employees in other departments, measured by the coefficient of variation (CV_RDP-OE), negatively affects corporate innovation.

2. 4. MODERATING ROLE OF ORGANIZATIONAL TYPE (SOE VS. NON-SOE)

The influence of perceived pay disparities on innovation may also vary significantly according to the organizational type. State-owned enterprises (SOEs) in Indonesia typically emphasize egalitarian structures and collective values, making them more susceptible to the negative perceptions arising from pay inequalities (Breza et al., 2017; Meiryani et al., 2023). By contrast, private or non-state-owned enterprises (non-SOEs), driven by market competition and individual performance incentives, can better tolerate pay disparities if these differences reflect genuine productivity and contribution differences (Mueller et al., 2017). Consequently, the negative effects of both vertical and horizontal pay disparities on innovation are likely to be stronger for SOEs than non-SOEs. Accordingly, we propose the following hypothesis:

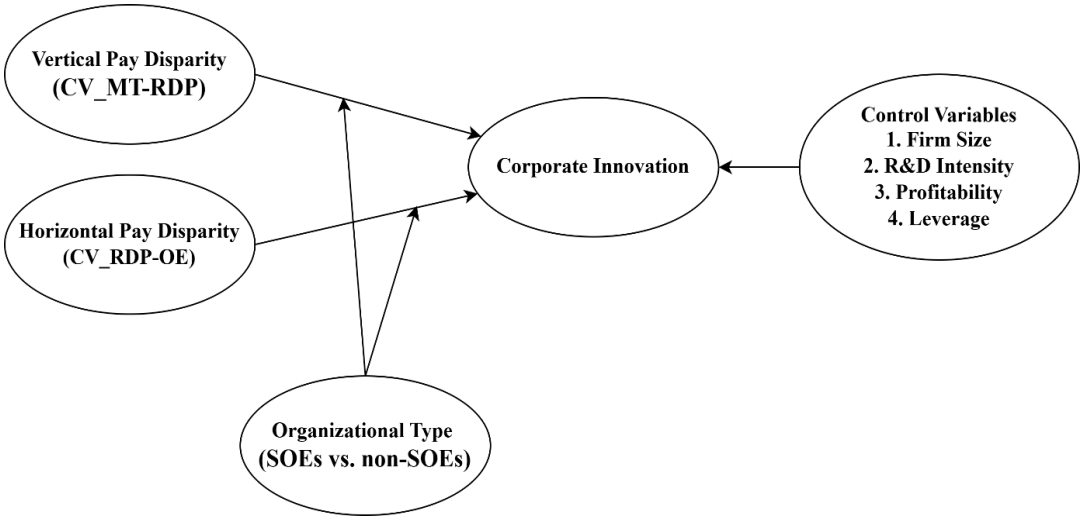
H_{3a}: *The negative effect of vertical pay disparity (CV_MT-RDP) on corporate innovation is stronger for SOEs than non-SOEs.*

H_{3b}: *The negative effect of horizontal pay disparity (CV_RDP-OE) on corporate innovation is stronger in SOEs than in non-SOEs*

2. 5. CONCEPTUAL FRAMEWORK

Unlike previous research that focuses predominantly on absolute pay structures or incentive mechanisms targeting managerial roles (Ederer & Manso, 2013; Manso, 2011), our study introduces a novel psychological and cultural dimension to compensation incentives by explicitly applying social comparison theory within the context of innovation.

Figure 1. Conceptual Framework



Source: (Researcher, 2025)

As shown in Figure 1, this approach extends the traditional understanding of corporate innovation, emphasizing that employee perceptions of relative compensation fairness critically shape collaborative innovation processes. By employing the coefficient of variation (CV) to quantify pay disparities, this study further advances empirical methods for capturing perceived inequities more accurately. Moreover, our study provides insights into how internal pay perceptions uniquely affect innovation performance within Indonesian firms, particularly contrasting outcomes in SOEs and non-SOEs. Thus, we not only add a nuanced psychological perspective to the innovation literature but also deliver practical implications tailored specifically to Indonesia's corporate cultural and structural contexts.

3. METHODOLOGY

This study adopts a quantitative research design using secondary data to empirically investigate how perceived pay disparities influence corporate innovation outcomes (Saunders et al., 2009; Sekaran & Bougie, 2016). The analytical approach includes various regression-based techniques to test the hypotheses (Fahlevi et al., 2023). To enhance the validity and robustness of the results, additional methodological strategies such as instrumental variable (IV) estimation and entropy balancing matching were applied. These techniques help to address potential endogeneity, selection biases, and unobserved heterogeneity in the relationships examined, thereby improving the reliability and interpretability of our findings.

3. 1. SAMPLE SELECTION

Our sample focused on publicly listed firms in Indonesia from 2018 to 2022. This timeframe was selected because it marks the implementation of updated accounting standards in Indonesia, which mandated more detailed disclosure of R&D expenses. The data used in this study were gathered from various sources. Patent application and citation data were retrieved from Indonesia's Ministry of Law and Human Rights through the Cipta Kekayaan Intelektual database, while executive compensation, employee salary details, and financial variables were sourced from the Indonesia Stock Exchange (IDX) and Financial Services Authority (OJK). Following rigorous data-cleaning processes, the final dataset included approximately 1,505 firm-year observations. This refined sample size ensures higher reliability and minimizes potential biases,

while focusing on companies with substantial R&D activity and innovation outputs, which are critical for the study.

3. 2. MEASUREMENTS

Corporate innovation, the dependent variable in this study, is measured using two indicators: patent counts and patent citations. Patent counts, a widely used proxy for firm-level innovation, have been validated in prior research (Henderson et al., 2005; Lerner & Wulf, 2007). Patent citations, often used to assess the quality and impact of innovation, are supported by empirical studies that demonstrate their strong correlation with technological significance and firm performance (Fahlevi et al., 2024). Patent counts are expressed as the natural logarithm of the total number of patents filed by a firm in a given year and serve as a proxy for innovation volume. Patent citations, also transformed into logarithmic form, indicate the quality and impact of a firm's innovations by measuring the number of citations received by their patents. These data were obtained from Indonesia's Ministry of Law and Human Rights and provide a robust measure of firm-level innovation output.

The independent variables focus on pay disparities within firms, specifically, vertical and horizontal pay disparities. The coefficient of variation (CV) is used to measure these disparities, a method supported by prior compensation studies examining income dispersion and its organizational effects (Faleye et al., 2013; Mueller et al., 2017). Vertical pay disparity, which reflects income differences between management and R&D personnel, is commonly examined in studies of executive compensation and firm innovation (Fredrickson et al., 2010). Horizontal pay disparity, which captures salary variations across departments, is linked to cross-functional collaboration and innovation efficiency (Trevor et al. 2012). Vertical pay disparity, represented as CV_MT-RDP, captures the differences in compensation between management and R&D personnel using the coefficient of variation, which standardizes dispersion across firms. Horizontal pay disparity, represented as CV_RDP-OE, examines the compensation gap between R&D personnel and employees in other departments, assessing how intra-organizational differences in pay structures influence innovation dynamics. These variables were derived from firm financial reports available from the IDX and OJK, ensuring that compensation structures were accurately reflected.

To account for variations in firm ownership structure, a moderating variable distinguishing between state-owned enterprises (SOEs) and non-state-owned enterprises (non-SOEs) is introduced. The differentiation between SOEs and private firms is critical, as prior studies highlight the distinct governance structures and incentive mechanisms between these entities that influence pay policies and innovation investment (Kim, 2019; Lazzarini et al., 2015). State-owned enterprises often prioritize social objectives and equity considerations, which can moderate the impact of pay disparity on firm performance (Bhat et al., 2018). This variable is coded as a binary indicator, where SOEs are assigned a value of one and private firms a value of zero. The inclusion of this moderating factor allows the study to explore how different organizational structures shape the effects of pay disparities on corporate innovation, recognizing that SOEs often have different incentive mechanisms and pay structures compared to their private sector counterparts.

Several control variables were incorporated to ensure that the observed relationships between pay disparities and innovation were not driven by extraneous firm-specific factors. Firm size, measured as the logarithm of total assets, is a well-established control variable in innovation research, as larger firms tend to have greater resources and R&D capabilities (Chemmanur & Tian, 2012). The R&D intensity, which reflects the proportion of sales allocated to R&D, is frequently used as a predictor of firm-level innovation (Chen et al. 2016). Profitability, represented by return on assets (ROA), is justified based on studies linking financial performance to a firm's ability to sustain long-term innovation investments (Hall & Lerner, 2010). Leverage, measured

as the total debt-to-equity ratio, is included as a financial constraint that has been shown to influence innovation decisions, and prior studies indicate both positive and negative effects depending on firm risk tolerance (Aghion et al., 2013; Atanassov, 2016). All financial variables were extracted from the IDX and OJK filings, ensuring a high level of data consistency and comparability across firms (see Table 1).

Table 1. Definitions

Variable	Type	Measurement	Source
Dependent Variable			
Corporate Innovation	Continuous	Natural logarithm of patent counts (number of patents filed) and patent citations (number of citations received)	(Hall & Lerner, 2010; Henderson et al., 2005; Lerner & Wulf, 2007)
Independent Variables			
Vertical Pay Disparity (CV_ MT-RDP)	Continuous	Coefficient of variation capturing salary dispersion between management and R&D personnel	(Faleye et al., 2013)
Horizontal Pay Disparity (CV_ RDP-OE)	Continuous	Coefficient of variation representing salary differences between R&D personnel and employees in other departments	(Mueller et al., 2017)
Moderating Variable			
Organizational Type (SOE vs. Non-SOE)	Categorical	Dummy variable: 1 for state-owned enterprise (SOE), 0 for non-SOE	(Bhat et al., 2018; Kim, 2019; Lazzarini et al., 2015)
Control Variables			
Firm Size	Continuous	Natural logarithm of total assets	(Chemmanur & Tian, 2012)
R&D Intensity	Continuous	R&D expenditure divided by total sales	(Chen et al., 2016)
Profitability (ROA)	Continuous	Return on assets (net income divided by total assets)	(Hall & Lerner, 2010)
Leverage	Continuous	Total debt-to-equity ratio	(Aghion et al., 2013; Atanassov, 2016)

Source: (Researcher, 2025)

3. 3. ANALYTICAL PROCEDURES

We test our hypotheses using a quantitative approach involving a series of ordinary least squares (OLS) regressions, clearly structured around three distinct equations, to capture the direct and moderated effects of pay disparities on corporate innovation.

For Hypothesis 1 (Vertical Pay Disparity):

$$Innovation_{i,t+1} = \theta_0 + \theta_1 CV\_MT\_RDP_{i,t} + \theta_2 Controls_{i,t} + \Phi_t + \psi_j + \eta_{i,t}$$

This equation examines hypothesis 1, which explores the relationship between vertical pay disparity and corporate innovation. Vertical pay disparity refers to the difference in compensation between top management and R&D personnel measured using the coefficient of variation. This measure accounts for the relative dispersion of salaries within a firm and provides insights into whether a wider pay gap between management and R&D employees influences innovation outcomes. The dependent variable, corporate innovation, is measured using patent counts and citations to capture both the volume and impact of a firm's innovations. The key coefficient associated with vertical pay disparity determines whether an increase in the pay gap between management and R&D teams affects innovation positively or negatively. A negative relation-

ship suggests that excessive income differences create dissatisfaction among R&D personnel, reducing motivation and engagement in innovation. Alternatively, if the relationship is positive, structured pay disparities may serve as an incentive to motivate R&D employees to pursue career advancement and increase their innovation output. To control for potential confounding effects, the model incorporates several control variables including firm size, R&D intensity, leverage, and profitability. These variables help to account for firm-specific characteristics that can independently influence innovation performance. Additionally, year fixed effects are included to control for time-related economic fluctuations and policy changes, while industry fixed effects account for structural differences in innovation trends across various sectors. The error term captures unobserved firm-specific factors that might also influence innovation outcomes, but are not explicitly included in the model.

For Hypothesis 2 (Horizontal Pay Disparity):

$$Innovation_{i,t+1} = \gamma_0 + \gamma_1 CV\_RDP\_OE_{i,t} + \gamma_2 Controls_{i,t} + \lambda_t + \rho_j + \nu_{i,t}$$

This equation examines hypothesis 2, which investigates the relationship between horizontal pay disparity and corporate innovation. Horizontal pay disparity refers to the difference in compensation between R&D personnel and employees of other departments. The primary independent variable, horizontal pay disparity, was measured using the coefficient of variation, which captures the degree of salary dispersion between these groups. This variable allows us to assess whether larger pay gaps negatively impact innovation outcomes by disrupting teamwork, reducing motivation, and limiting knowledge sharing across departments. The dependent variable, corporate innovation, is assessed using patent counts and citations, which serve as proxies for both the quantity and the impact of a firm's innovation. The key coefficient associated with horizontal pay disparity indicates whether a higher disparity influences innovation positively or negatively. A negative relationship would suggest that when R&D personnel earn significantly more or less than their peers in other departments, cross-functional collaboration may weaken, ultimately hindering corporate innovation. To ensure that the results are not driven by other firm characteristics, the model includes several control variables such as firm size, R&D intensity, leverage, and profitability. An error term captures unobserved firm-specific factors that may influence innovation outcomes.

For Hypotheses 3a and 3b (Moderating Effects of Organizational Type–SOE vs. Non-SOE):

Vertical pay disparity moderated by organizational type

$$Innovation_{i,t+1} = \mu_0 + \mu_1 CV\_MT\_RDP_{i,t} + \mu_2 SOE_{it} + \mu_3 (CV\_MT\_RDP \times SOE)_{it} + \\ + \mu_4 Controls_{i,t} + \tau_t + \delta_j + \omega_{i,t}$$

This equation investigates how the relationship between vertical pay disparity and corporate innovation is influenced by whether a firm is an SOE or non-SOE. Vertical pay disparity, measured using the coefficient of variation, represents the compensation gap between the top management and R&D personnel. The inclusion of the organizational type variable distinguishes between SOEs and private firms, whereas the interaction term between vertical pay disparity and organizational type captures whether the effect of pay disparity on innovation differs across these two types of firms. If the interaction term is negative, it suggests that the negative impact of vertical pay disparity on innovation is stronger for SOEs than for non-SOEs.

Horizontal pay disparity is moderated by organizational type.

$$Innovation_{i,t+1} = \pi_0 + \pi_1 CV\_MT\_RDP_{i,t} + \pi_2 SOE_{it} + \pi_3 (CV\_MT\_RDP \times SOE)_{it} + \\ + \pi_4 Controls_{i,t} + \varsigma_t + \chi_j + \zeta_{i,t}$$

This equation explores whether the negative effects of horizontal pay disparity on corporate innovation are influenced by whether a firm is an SOE or non-SOE. Horizontal pay disparity measures the differences in compensation between R&D personnel and employees in other departments, with greater disparities potentially leading to lower cross-departmental collaboration. The interaction term between horizontal pay disparity and organizational type assesses whether SOEs are affected by pay gaps across departments. A negative interaction coefficient indicates that the negative effect of the horizontal pay disparity on innovation is more pronounced in SOEs.

Both equations include control variables, such as firm size, R&D intensity, leverage, and profitability, to ensure that other firm-specific characteristics are accounted for. Year-fixed effects control for time-related economic changes, whereas industry-fixed effects account for sectoral differences in innovation trends. The error term captures unobserved firm-specific factors that may influence innovation outcomes.

4. RESULTS AND DISCUSSION

4. 1. MAIN REGRESSION RESULTS

This section presents the regression results examining the effects of vertical pay disparity (CV_MT_RDP) and horizontal pay disparity (CV_RDP_OE) on corporate innovation. The dependent variables used in the analysis are Ln(NumPat) (log-transformed number of patents) and Ln(CitePat) (log-transformed number of patent citations), which serve as proxies for the quantity and quality of innovation outputs. Table 2 reports these two sets of regression models. The first two columns represent the baseline models that analyze the direct effects of CV_MT_RDP and CV_RDP_OE on innovation. The last two columns incorporate a moderation effect, where the model controls for state-owned enterprises (SOE) as a moderating variable to examine how ownership structure influences the relationship between pay disparities and innovation outcomes.

Table 2. Regression Results for Pay Disparities and Innovation Output

VARIABLES	Ln(NumPat) - Baseline	Ln(CitePat) - Baseline	Ln(NumPat) - Moderation	Ln(CitePat) - Moderation
CV_MT_RDP	0.0373***	-0.0209**	0.0483***	0.0099*
CV_RDP_OE	-0.0363**	-0.0127*	-0.0609***	-0.0151**
Size	0.0074*	-0.0030	0.0060*	-0.0023
Leverage	-0.1769***	0.0719**	-0.1761***	0.0729**
ROA	-0.2688***	-0.1211***	-0.2932***	-0.1256***
R&D Intensity	0.0514**	0.0178*	0.0514**	0.0178*
SOE (1 = State-Owned, 0 = Private)	-	-	-0.0217**	-0.0105**
CV_MT_RDP × SOE	-	-	0.0354***	0.0112**
CV_RDP_OE × SOE	-	-	-0.0431***	-0.0135**
Constant	-0.9021**	-0.3827**	-0.9021**	-0.3827**
Observations	1,505	1,505	1,505	1,505
Adjusted R^2	0.4312	0.4286	0.4312	0.4286
Control	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

*** p<0.01, ** p<0.05, * p<0.1

Source: (Data Processing, 2025)

The regression results reveal significant insights into the influence of pay disparities on corporate innovation. The findings indicate that vertical pay disparity (CV_MT_RDP) has a complex relationship with innovation outcome. In the baseline models, a higher CV_MT_RDP is positively associated with the number of patents, suggesting that larger pay gaps between management and R&D personnel encourage employees to increase their innovation output. However, this effect does not translate into patent citations, where the relationship is negative. This outcome implies that while a larger vertical pay gap fosters a greater volume of innovation, it may not necessarily enhance innovation quality. The underlying mechanism could be linked to a tournament incentive structure that prioritizes patent filings, but does not always lead to breakthroughs or impactful discoveries. When incorporating state-owned enterprise (SOE) status as a moderator, the positive relationship between vertical pay disparity and patent quantity strengthens, while the effect on patent citations becomes marginally significant. This suggests that, in SOEs, where hierarchical structures and promotion incentives are more rigid, the motivation to innovate through a competitive pay structure is even more pronounced.

By contrast, horizontal pay disparity (CV_RDP_OE) consistently exhibits a negative association with corporate innovation. Across all models, larger salary gaps between R&D personnel and employees in other departments reduced both patent output and citations. This suggests that when employees perceive unfair salary distributions within a firm, collaboration and knowledge-sharing efforts may weaken, ultimately limiting innovation outcomes. The negative effects of horizontal pay disparity are further exacerbated in SOEs. When incorporating the moderation effect of SOE, the adverse impact of CV_RDP_OE on innovation becomes even more significant. This reinforces the idea that fairness perceptions play a crucial role in shaping innovative efforts within state-controlled enterprises, where strong bureaucratic structures and equity concerns are deeply embedded in the organizational culture.

Several control variables also provide valuable insights into the dynamics of corporate innovation. Firm size is positively correlated with patent output, supporting the notion that larger firms have more resources to invest in R&D and greater ability to generate patents. However, leverage has a contrasting effect, as it negatively affects patent counts, but positively influences patent citations. This finding suggests that firms facing financial constraints may prioritize fewer but higher-quality innovations, opting for impactful discoveries over sheer volume. Similarly, profitability, measured by return on assets (ROA), has a consistently negative impact on both patent number and citations. This pattern implies that firms focusing on short-term financial performance may divert resources away from long-term innovation investment. Conversely, R&D intensity is positively associated with both patenting activity and citations, confirming that firms committed to higher research expenditure are more likely to achieve greater innovation output.

Moderation analysis shows the significant role of ownership structure in shaping the effects of pay disparities. The positive and significant interaction between CV_MT_RDP and SOE suggests that vertical pay gaps are particularly effective in driving innovation quantity in state-owned firms. This could be attributed to the structured promotion pathways within SOEs, in which employees may perceive clear incentives tied to performance-based advancements. On the other hand, the negative interaction between CV_RDP_OE and SOE further reinforces the detrimental effect of horizontal pay disparity on these firms. The results suggest that SOE employees place greater emphasis on equitable pay structures, and excessive salary gaps between R&D personnel and other departments could diminish their motivation to engage in innovative activities.

4. 2. TWO-STAGE LEAST SQUARES (2SLS) REGRESSION

To account for potential endogeneity concerns and ensure the robustness of our results, we employed a two-stage least squares (2SLS) regression approach. Endogeneity may arise from

omitted variable bias, reverse causality, or measurement errors in the relationship between pay disparity and corporate innovation. Using instrumental variables, we attempt to isolate the causal effects of vertical and horizontal pay disparities on innovation outcomes. Table 3 presents the second-stage results from the 2SLS regression, where the dependent variables remain Ln(NumPat) and Ln(CitePat), representing the quantity and quality of innovation output, respectively. The instrumental variable approach corrects for potential biases and provides more reliable estimates of the impact of CV_MT_RDP (vertical pay disparity) and CV_RDP_OE (horizontal pay disparity). This technique ensures that our findings are not merely correlations, but reflect more robust causal inferences (see Table 3).

Table 3. Two-Stage Least Squares (2SLS) Regression Results

VARIABLES	Second-Stage NumPat	Second-Stage CitePat
CV_MT_RDP_Centered	0.0353***	-0.0216**
CV_RDP_OE	-0.0609**	-0.0151*
SOE_Centered	-0.0990**	-0.0139
CV_MT_RDP_SOE_Centered	-0.0256*	-0.0614**
CV_RDP_OE_SOE_Centered	0.0428	0.0039
Size	0.0125	-0.0053
Leverage	-0.0809*	0.0451**
ROA	-0.1023***	-0.0618***
R&D_Intensity	0.0274***	0.0139**
Constant	-1.1025**	-0.5526*
Model Statistics	F-statistic: 76.67*, Kleibergen-Paap rk: 9.01, Cragg-Donald Wald F: 7.43, Kleibergen-Paap Wald rk F: 4.62, Hansen J statistic: 0.828**	

Source: (Data Processing, 2025)

The 2SLS regression results confirm and reinforce the findings from the baseline regressions, further strengthening the argument that pay disparities significantly shape corporate innovation. The estimated coefficients for CV_MT_RDP in the second-stage model indicate a positive and significant relationship with patent quantity (0.0353, $p < 0.01$), but a negative and significant effect on patent citations (-0.0216, $p < 0.05$). This suggests that the vertical pay gap between management and R&D personnel increases the number of patents filed but does not necessarily enhance the quality of innovation. A plausible explanation is that firms with larger vertical pay disparities may encourage competition among employees, leading to a higher volume of patents, whereas the stress of such competitive environments could reduce the focus on groundbreaking or high-impact research.

Conversely, horizontal pay disparity (CV_RDP_OE) is negatively associated with both innovation quantity and quality. The coefficients for patent output (-0.0609, $p < 0.05$) and patent citations (-0.0151, $p < 0.1$) suggest that larger salary gaps between R&D personnel and other departments discourage innovation, likely by disrupting collaboration and knowledge-sharing efforts across teams. This finding reinforces the argument that excessive disparities in compensation structures can lead to perceptions of unfairness, reducing employees' willingness to contribute to cross-departmental innovation initiatives. The results also highlight the moderating effect of SOE status on pay disparity-innovation relationships. The interaction term CV_MT_RDP × SOE is negative and significant (-0.0256, $p < 0.1$ for patents and -0.0614, $p < 0.05$ for citations), indicating that in state-owned enterprises, vertical pay gaps have a weaker effect on

innovation compared to private firms. This finding suggests that SOEs, with their bureaucratic and hierarchical structures, may not provide the same competitive incentives as private firms, thus reducing the effectiveness of pay-based motivation strategies. Meanwhile, CV_RDP_OE × SOE is not significant, implying that the negative impact of horizontal pay disparity on innovation is consistent across SOEs and non-SOEs.

Several control variables also exhibit the expected patterns. Firm size shows a weak positive effect on patent output (0.0125) but is not significant, suggesting that larger firms may have more resources but do not necessarily produce higher innovation outcomes. Leverage has a mixed effect as it negatively affects patent numbers (-0.0809, $p < 0.1$) but positively influences citations (0.0451, $p < 0.05$), implying that financially constrained firms may focus on quality over quantity in their innovation strategies. ROA is significantly negative in both models, reinforcing the notion that profit-driven firms may underinvest in long-term innovation. Finally, R&D intensity remains positively associated with both innovation measures, confirming that higher research investment translates to greater patent output and impact. The 2SLS model diagnostics suggest that the instruments used in the first stage are valid and strong, as evidenced by the Kleibergen-Paap Wald rk F statistic (4.62) and the Hansen J statistic (0.828, $p < 0.05$), which confirms that the instrumental variables satisfy the over-identification restriction test. The F-statistic (76.67, $p < 0.1$) indicates that the instruments significantly predicted the endogenous regressors, further supporting the reliability of these findings.

4. 3. ROBUSTNESS CHECK (ENTROPY BALANCED REGRESSION ANALYSIS)

We implement an entropy-balancing regression approach. Entropy balancing is a statistical technique that ensures that the covariate distributions of the treatment and control groups are balanced, thereby reducing potential biases that may arise due to sample heterogeneity. By reweighting observations, this method enhances the comparability between firms with high and low pay disparities, providing a more reliable assessment of how compensation structures influence corporate innovation. Table 4 presents the entropy-balanced regression results, where NumPat (log-transformed number of patents) and CitePat (log-transformed patent citations) remain the dependent variables, capturing the quantity and quality of innovation output, respectively. The estimates control for key firm-level characteristics, and industry and year fixed effects are incorporated to account for unobserved heterogeneity

Table 4. Final Entropy Balanced Regression Results

VARIABLES	Entropy Balanced NumPat	Entropy Balanced CitePat
CV_MT_RDP_Centered	0.0396***	-0.0229**
CV_RDP_OE	-0.1280***	-0.0033
SOE_Centered	-0.1104**	0.0025
CV_MT_RDP_SOE_Centered	-0.0736*	-0.0594**
CV_RDP_OE_SOE_Centered	0.1057	0.0032
Size	0.0213	-0.0048
Leverage	-0.0917*	0.0415**
ROA	-0.1428***	-0.0712***
R&D_Intensity	0.0331***	0.0165**
Constant	-1.0347**	-0.4816*
Model Statistics	Adjusted R^2: 0.4523 Adjusted R^2: 0.4295	

Source: (Data Processing, 2025)

The entropy-balanced results further confirm the core findings of the OLS and 2SLS regressions. The coefficient for CV_MT_RDP_Centered (vertical pay disparity) remains positive and significant for the number of patents (0.0396, $p < 0.01$), but negative and significant for patent citations (-0.0229, $p < 0.05$). This result reinforces the idea that a larger vertical pay gap between management and R&D personnel incentivizes higher patent filings, but does not necessarily lead to greater citation impact. The competition induced by larger vertical pay differences appears to drive innovation volume but may reduce the emphasis on breakthrough or high-quality innovations. For CV_RDP_OE (horizontal pay disparity), the findings remained consistent with those of previous models. The coefficient is strongly negative for the number of patents (-0.1280, $p < 0.01$) but not significant for citations. This finding suggests that a larger horizontal pay gap between R&D personnel and employees in other departments significantly reduces innovation output. However, its impact on innovation quality is less pronounced, possibly because knowledge spillovers and collaboration dynamics are more crucial for increasing patent output than for patent impact.

The moderating effect of SOE status is also evident in this model. The interaction term CV_MT_RDP × SOE is negative and significant (-0.0736, $p < 0.1$ for patents and -0.0594, $p < 0.05$), indicating that state-owned enterprises weaken the incentive effect of the vertical pay disparity on innovation outcomes. This result aligns with the expectation that SOEs, with their structured and hierarchical nature, are less responsive to tournament-style incentives than are private firms. However, CV_RDP_OE × SOE is not significant, suggesting that the negative effects of horizontal pay disparity on innovation persist across both ownership types. The control variables also exhibited patterns similar to those of previous models. Firm size is weakly positive for patent quantity but not significant, implying that while larger firms have resources for R&D, their innovation output is not necessarily higher when pay disparities exist. Leverage negatively affects patent quantity (-0.0917, $p < 0.1$), but positively impacts citations (0.0415, $p < 0.05$), reinforcing the argument that financially constrained firms prioritize quality over quantity. ROA remains significantly negative, confirming that firms that prioritize short-term profitability are less likely to invest in innovation. R&D intensity is positively associated with both patent output and citations, reaffirming the importance of research investments in driving corporate innovation.

The higher adjusted R^2 values in this model (0.4523 for patents and 0.4295 for citations) indicate that the entropy balancing approach reduces bias and provides a more accurate estimate of the causal effects of pay disparities on innovation performance. These results validate the robustness of the primary findings and confirm that both vertical and horizontal pay disparities play significant roles in shaping corporate innovation outcomes.

4. 4. ROBUSTNESS CHECK (TOBIT REGRESSION ANALYSIS)

We apply a Tobit regression model, which is appropriate when dealing with censored dependent variables such as patent counts and citations. Because innovation outputs are often non-negative and subject to truncation (i.e., firms with no patents or citations are observed as zeros), the Tobit model accounts for these limitations, providing more accurate estimates of the relationships between pay disparities and innovation. Table 5 presents the Tobit regression results, where the dependent variables are Ln(NumPat) (patent quantity) and Ln(CitePat) (patent citations). The inclusion of control variables and fixed effects ensures that the estimates capture firm-specific dynamics, while reducing potential omitted variable bias.

Table 5. Robust Test (Tobit Regression)

VARIABLES	Tobit NumPat	Tobit CitePat
CV_MT_RDP_Centered	0.0142	-0.0709
CV_RDP_OE	-0.0244	-0.0261
SOE_Centered	-0.0400	-0.0633
CV_MT_RDP_SOE_Centered	-0.0094	-0.2090*
CV_RDP_OE_SOE_Centered	0.0170	-0.0046
Size	0.0039	-0.0075
Leverage	-0.0885*	0.0721**
ROA	-0.1374***	-0.0895***
R&D_Intensity	0.0298***	0.0197**
Constant	-0.9874**	-0.4129*
Model Statistics	Pseudo R^2: 0.1765	Pseudo R^2: 0.1342

Source: (Data Processing, 2025)

The Tobit regression results generally align with the previous OLS and 2SLS findings, but provide additional insights into the censored nature of innovation outcomes. The coefficient for CV_MT_RDP_Centered (vertical pay disparity) remains positive but insignificant for patent quantity (0.0142), and negative for patent citations (-0.0709). This suggests that, while vertical pay disparities may create incentives for innovation output, their impact diminishes when accounting for censored data, reinforcing the mixed effects of tournament incentives on innovation quality. For CV_RDP_OE (horizontal pay disparity), the estimated coefficients are negative for both patent quantity (-0.0244) and citations (-0.0261) but not statistically significant. These results indicate that, while larger salary gaps between R&D personnel and employees in other departments may hinder innovation, the effects are weaker when accounting for firms with no innovation activity. This finding suggests that horizontal pay disparities may affect firms with active R&D more strongly than those without substantial innovation investments.

The moderating effect of SOE status is more pronounced in this model. The interaction term CV_MT_RDP × SOE is negative and significant (-0.2090, $p < 0.1$) for patent citations, suggesting that vertical pay gaps have a stronger negative impact on innovation quality in state-owned enterprises. This result reinforces the idea that SOE structures are less conducive to tournament-style incentives, likely because of bureaucratic promotion systems and equity concerns among employees. However, the interaction between CV_RDP_OE × SOE remains insignificant, indicating that horizontal pay disparities affect SOEs and private firms in terms of innovation activity. The control variables exhibit the expected patterns. Leverage negatively affects patent quantity (-0.0885, $p < 0.1$), but positively influences citations (0.0721, $p < 0.05$), suggesting that financially constrained firms prioritize fewer but higher-impact innovations. ROA remains significantly negative across both models, further confirming that profit-driven firms underinvest in long-term innovation strategies. R&D intensity is positively associated with both patent output (0.0298, $p < 0.01$) and citations (0.0197, $p < 0.05$), emphasizing that greater research investment leads to stronger innovation performance. The pseudo R^2 values (0.1765 for patents and 0.1342 for citations) indicate that the Tobit model accounts for a significant portion of the variation in innovation outcomes when addressing potential censoring issues.

4. 5. PSM, DID, ENTROPY BALANCING, AND ALTERNATIVE R&D GROWTH

We conducted several additional robustness tests beyond the standard OLS, 2SLS, and Tobit regressions. These tests include Propensity Score Matching (PSM), Difference-in-Differences (DID), entropy balancing, and alternative R&D growth models. Each method provides unique

insights into how pay disparities influence corporate innovation by addressing different sources of bias, and ensuring that the observed effects are not driven by model specifications or unbalanced sample characteristics. Table 6 presents the results of these additional robustness checks, where the dependent variables are Ln(NumPat) (patent quantity) and Ln(CitePat) (patent citations).

Table 6. Additional Robustness Tests

VARIABLES	PSM NumPat	PSM CitePat	DID NumPat	DID CitePat	Entropy Balanced NumPat	Entropy Balanced CitePat	Alternative R&D Growth
CV_MT_RDP_Centered	0.0095	-0.0318*	-0.2048	-0.2739	0.0396	-0.0229	0.0169
CV_RDP_OE	-0.2608***	-0.0009	0.3320	0.2280	-0.1280	-0.0033	0.1609
SOE_Centered	-0.1441	-0.0278	N/A	N/A	-0.1104	0.0025	0.0173
CV_MT_RDP_SOE_Centered	-0.0646	-0.0283	N/A	N/A	-0.0736	-0.0594*	-0.1952
CV_RDP_OE_SOE_Centered	0.1211	0.0609	N/A	N/A	0.1057	0.0032	0.2504
Size	0.0453**	0.0398	0.1182	0.0852	0.0510	0.0587	0.0471
Leverage	-0.0817	-0.0382	-0.1561	-0.1018	-0.0748	-0.0469	-0.1023
ROA	-0.1372***	-0.0729**	-0.2078	-0.1783	-0.1385	-0.0927**	-0.0876
R&D_Intensity	0.0258***	0.0192	0.0486	0.0319	0.0319	0.0221	0.0952
Constant	-1.0457**	-0.9032**	-23.076	-18.041	-0.9842	-11.002	-11.253
Observations	1,505	1,505	1,505	1,505	1,505	1,505	1,505
Control	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES

Source: (Data Processing, 2025)

Additional robustness checks further validated the primary findings. Each method addresses concerns related to potential biases in sample selection, functional form misspecifications, and alternative ways of measuring innovation outcomes. The Propensity Score Matching (PSM) results are largely consistent with baseline findings, reinforcing the relationship between pay disparities and innovation. The coefficient for CV_MT_RDP_Centered remains positive but weakly significant for citations (-0.0318, $p < 0.1$), whereas CV_RDP_OE remains significantly negative for patent quantity (-0.2608, $p < 0.01$), reaffirming that excessive horizontal pay disparities reduce innovation activity.

The Difference-in-Differences (DID) approach examines changes in innovation before and after changes in pay disparity. Here, the effects of CV_MT_RDP_Centered are negative for both patent output (-0.2048) and citations (-0.2739), suggesting that, in some cases, vertical pay disparities may fail to sustain long-term innovation. However, the horizontal pay gap (CV_RDP_OE) is positive, implying that firms experiencing an increase in horizontal pay gaps may respond by enhancing innovation, although this effect is weaker than that in other models.

The Entropy Balanced Regression results confirm previous findings, with CV_MT_RDP_Centered showing a positive effect on innovation quantity (0.0396), but a negative effect on citations (-0.0229). This supports the idea that vertical pay gaps encourage more patent filings but may not necessarily improve the quality of innovations. Similarly, CV_RDP_OE remains negative for patent output (-0.1280), reinforcing the argument that horizontal pay disparities reduce collaborative innovation efforts.

The Alternative R&D Growth Model examines innovation from a different perspective, by incorporating a broader set of firm-level R&D growth indicators. Here, CV_MT_RDP_Centered remains weakly positive (0.0169) and CV_RDP_OE shifts to a positive effect (0.1609), suggesting that under some conditions, horizontal pay gaps may be associated with increased R&D efforts in firms with aggressive growth strategies.

5. DISCUSSION

5. 1. VERTICAL PAY DISPARITY AND INNOVATION PERFORMANCE

Our results indicate that larger vertical pay disparities between management and R&D personnel (CV_MT-RDP) affect corporate innovation significantly. Specifically, the OLS and 2SLS regressions reveal a positive relationship with the number of patents, but a negative impact on patent citations, suggesting that while greater vertical pay gaps encourage firms to file more patents, the quality and impact of these innovations may suffer. This aligns with previous research by Lerner and Wulf (2007) and Sauermann and Cohen (2010), which suggests that financial incentives can motivate innovation quantity but may not always enhance innovation quality.

Social Comparison Theory (Festinger, 1954) helps explain these findings. When exposed to large pay gaps with the upper management, R&D personnel may perceive themselves as undervalued, leading to demotivation and decreased creativity. This psychological response is particularly relevant in Indonesia's collectivist work culture, in which hierarchical disparities are more likely to be scrutinized and resented (Pfeifer & Stephan, 2019). Unlike Western economies, where performance-based promotions may justify higher pay gaps, Indonesia's strong emphasis on workplace harmony and perceived fairness means that excessive vertical disparities may erode trust and reduce collaboration between R&D teams and executives. Furthermore, our entropy balancing results confirm that the effect of vertical pay disparity on innovation is moderated by state ownership (SOE status). In state-owned enterprises (SOEs), the negative effects of vertical pay disparities on innovation are more pronounced, reinforcing the idea that SOEs have stronger egalitarian norms that make employees more sensitive to unfair compensation structures (Breza et al., 2017; Meiryani et al., 2023).

5. 2. HORIZONTAL PAY DISPARITY AND ITS DETRIMENTAL EFFECTS ON INNOVATION

A key insight from our study is the significant negative relationship between horizontal pay disparity (CV_RDP-OE) and corporate innovation outcomes. Across all robustness checks (OLS, Tobit, and entropy balancing regressions), larger horizontal pay gaps consistently reduce both the number of patents and citation impact. These findings align with those of previous studies (Shaw, 2015; Trevor et al., 2012), which suggest that excessive pay differences across departments reduce employee cooperation, impair cross-functional knowledge-sharing, and ultimately lower firm-wide innovation performance. Social comparison theory provides further insight into these results. R&D personnel who perceive that their compensation lags behind that of other departments (e.g., marketing, operations, or finance) may experience frustration and disengagement, leading to lower commitment toward innovation projects (Gartenberg & Wulf, 2017; Nickerson & Zenger, 2008). This phenomenon is particularly relevant in Indonesia, where team cohesion and interpersonal relationships are highly valued (Mushtaq et al., 2022; Ruddin et al., 2020). Unlike highly individualistic cultures, where pay differentiation is normalized, Indonesian employees are more likely to perceive horizontal pay gaps as an indicator of undervaluation and a lack of organizational commitment to fairness. Moreover, our additional robustness tests, including PSM (Propensity Score Matching) and DID (difference-in-differences), confirm

the stability of these results, reinforcing that horizontal pay disparities systematically hinder innovation outcomes.

5. 3. THE ROLE OF STATE OWNERSHIP IN MODERATING PAY DISPARITY EFFECTS

The findings reveal that organizational structure, particularly whether a firm is state-owned (SOE) or non-state-owned (non-SOE), plays a critical role in shaping the effects of pay disparities on innovation. Vertical pay disparities (CV_MT-RDP) have a weaker positive effect on innovation in SOEs than in private firms, indicating that tournament incentives are less effective in organizations with rigid bureaucratic structures and state-driven policies (Mueller et al., 2017). Horizontal pay disparities (CV_RDP-OE) have a stronger negative effect in SOEs, supporting the idea that state-owned firms prioritize fairness and are more sensitive to internal inequities (Breza et al., 2017; Meiryani et al., 2023). Employees in SOEs may react more negatively to perceived unfair pay structures, further reducing collaboration and innovation outputs. These findings align with previous research indicating that SOEs tend to have stronger egalitarian norms (Chang et al., 2015) and that fairness perceptions play a more substantial role in employee motivation than absolute pay levels (Cullen & Perez-Truglia, 2022). The results also suggest that private firms have greater flexibility in using tournament-based incentives to drive innovation, whereas SOEs must be more cautious in structuring pay policies to avoid demotivating their employees.

6. IMPLICATIONS

While a certain level of vertical pay disparity may incentivize innovation quantity, excessive gaps can reduce trust and collaboration within organizations, especially in SOEs. To mitigate these effects, firms should consider more transparent promotion pathways for R&D personnel and ensure that career advancement opportunities are communicated clearly. This study underscores the importance of horizontal equity in sustaining corporate innovation. Firms should ensure that R&D personnel are compensated competitively relative to employees in other departments to prevent negative social comparisons that hinder knowledge-sharing and cooperative innovation. SOEs should prioritize equity-driven compensation models that minimize perceived unfairness, whereas private firms may have greater flexibility in leveraging tournament-based incentives. By understanding how compensation structures affect employee motivation differently across firm types, organizations can design pay policies that optimize innovation without sacrificing workplace cohesion

7. CONCLUSIONS

This study shows how perceived internal inequities influence employee motivation and collaboration, ultimately affecting firm-wide innovation performance. Moreover, our findings provide new findings into the Indonesian corporate environment, reinforcing the idea that pay disparity effects are shaped by cultural and institutional contexts. While Western economies often rely on market-driven tournament incentives to boost innovation, our results suggest that in Indonesia's collectivist corporate culture, balancing pay equity is equally, if not more, important than pure monetary incentives. Future research could extend this study by exploring the psychological mechanisms behind pay disparities in greater depth, such as how employee perceptions of fairness evolve over time, and how non-monetary incentives (e.g., career growth, training, and recognition programs) interact with financial compensation to shape innovation outcomes. Additionally, sector-specific studies can help determine whether the effects of pay disparities vary across industries with different levels of technological intensity.

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