A Study of Internal Wage Disparities Among Employees, Corporate Investment Efficiency, and Total Factor Productivity

Zhenhan Liu

Jinan University-University of Birmingham Joint Institute, Jinan University, Guangzhou, China

104605966@qq.com

Abstract. In the context of the evolving executive remuneration disclosure system in China, particularly post-financial crisis during an era of general economic downturn, the phenomena of excessively high executive pay, a disconnect between compensation and performance, and growing disparities between executive and average employee remuneration have come under scrutiny. Such disparities appear incongruent with macroeconomic trends and have spurred empirical research within the academic realm. This body of work has increasingly focused on the complex relationship between intra-firm pay differentials and corporate performance, positing that the wage gap functions as a " double-edged sword ". On one hand, it can catalyze motivation within the workforce to compete for the highest rewards, thus enhancing overall corporate efficiency. On the other, excessive internal wage disparities may engender feelings of dissatisfaction and perceived injustice among lower-tiered employees, potentially inducing behaviors that are detrimental to firm performance. Current literature predominantly employs Return on Assets (*ROA*) as a solitary metric for evaluating corporate performance, leaving the broader implications of pay discrepancies on Total Factor Productivity (*TFP*) less thoroughly explored. Consequently, this study aims to fill this gap by conducting a systematic analysis of the impact exerted by internal pay disparities on the *TFP* of corporations. Utilizing a dataset composed of non-financial A-share companies listed in Shanghai, Shenzhen, and Beijing stock exchanges from 2011 to 2022, this investigation reveals that widening pay gaps within firms are associated with negative behavioral effects, manifesting in diminished corporate performance. The study also investigates and elucidates potential mechanisms through which inefficient investment behavior may mediate the relationship between internal pay disparities and firms' *TFP*.

Keywords: Employee wage gap; Total factor productivity of enterprises; Investment efficiency; Mediating effect; Panel regression

1 INTRODUCTION

In the contemporary competitive business landscape, enterprises face major challenges in pursuing innovation and improving total factor productivity. *TFP* serves as a holistic

R. Magdalena et al. (eds.), *Proceedings of the 2024 9th International Conference on Social Sciences and Economic Development (ICSSED 2024)*, Advances in Economics, Business and Management Research 289,
https://doi.org/10.2991/978-94-6463-459-4_45

metric encompassing various elements of a firm's production process, such as technological prowess, human capital investment, and managerial efficiency (Feng, Cheng & Liu, 2024)[1]. This measure inherently captures the essence of production efficacy by accounting for all productive inputs (Ibid). While employees, as the main body of the enterprise, have a compensation structure that not only reflects the characteristics of corporate governance, but also exerts a direct influence on the motivational dynamics of employees, the execution of corporate strategies, and, consequently, the economic output (Shiue, Yeh & Lu, 2022)[2]. As such, the issue of intra-firm pay disparities has persistently been an intricate and prominent concern within enterprise management. In line with the profound evolution of the market economy and the intensification of inter-enterprise competition, it has become incumbent upon firms to implement differentiated compensation tactics to entice and preserve talents , as well as to augment employee motivation and creativity (Grobler, Singh & Plessi, 2013)[3]. Nonetheless, an excessive divergence in remuneration can incite employee discontent and attrition, thereby jeopardizing the firm's stable progression (Lam et al., 2022)[4]. Therefore, a meticulous examination of intra-firm remuneration disparities is paramount for the augmentation of productivity and economic efficiency. Probing the nexus between intra-firm pay differentials and firm total factor productivity necessitates an elaborate comprehension of the patterns and alterations in pay distribution within the employee cohort and the prospective repercussions on firm performance. Hence, this study delves into the evaluation of remuneration distribution rationality among the corporate employees, elucidates the dynamics of corporate governance structures, the potency of incentive mechanisms, and the gene-sis of enduring competitive advantage within the firm.

Most of the extant literature predominantly concentrates on the direct impacts of pay differentials on firm performance, ignoring the underlying mechanisms through which these effects materialize. As a matter of fact, the excavation of the mechanism can help firms intuitively understand the ways to improve performance and broaden the horizons of the reform of corporate management regulations. Moreover, the existing research focuses on the pay gap within the executive team, while there is less research on whether the distribution of pay between executives and ordinary employees is reasonable. Based on the above considerations , this paper uses the panel data from Chinese listed enterprises spanning the period from 2011-2022. It aims to address the lacuna in existing research by examining both internal and external factors affecting enterprise performance. The study takes the role of employees' remuneration on their work motivation as the starting point, and joins the enterprise investment efficiency as the mediator variable, to explore the specific paths of the impact of intra-enterprise employees' remuneration disparity on the performance of enterprises. The subsequent structure of this paper unfolds as follows: the second part is the literature review and the formulation of research hypotheses; the third part delineates the research data and research design; the fourth part presents the empirical findings and their corresponding analyses, and the last part encapsulates the research conclusions and relevant implications.

2 RATIONALE AND RESEARCH HYPOTHESIS

Contemporary scholarship has engendered a dichotomous discourse regarding the nexus between intra-firm pay disparities and organizational performance. Predicated on the precepts of tournament theory, certain researchers posit that heightened intra-corporate competition serves as a catalyst for organizational growth and efficiency. Initially posited by Lazear (1981), and subsequently expanded upon by McLaughlin (1988), tournament theory contends that the augmentation of pay differentials within a competitive employee cohort is a pivotal incentive mechanism (Martono et al., 2022)[5]. This mechanism ostensibly motivates personnel to enhance performance and strive for superior compensation outcomes, thereby fostering an environment conducive to innovation and advancement within the firm (Ibid). Conversely, behavioral theorists argue that pronounced salary discrepancies may engender deleterious consequences. They advocate that collaborative synergies are imperative for the completion of routine or specialized tasks within an organization, which extends beyond the purview of solitary executives or employees (Zhang & Fan, 2012)[6]. In contexts characterized by extensive collaboration, excessive pay gaps may precipitate perceptions of inequity amongst the workforce, subsequently attenuating their motivation and job satisfaction. Such disparities have the potential to precipitate elevated attrition rates, thereby undermining organizational stability and continuity. Additionally, large intra-firm salary differentials could incite interpersonal conflicts, as the pursuit of individual monetary gains may inadvertently be to the detriment of colleagues, thereby sowing discord within the corporate milieu and threatening the internal harmony and equilibrium of the enterprise.

On the other hand, the framework of relative deprivation posits that as the disparity in remuneration escalates, individuals in higher echelons of compensation may exhibit signs of a complacent and indolent attitude towards their occupational duties (Wei, 2016)[7]. This could precipitate a predisposition towards short-horizon investment philosophies, potentially driven by a combination of lethargy and aversion to risk, thereby leading to a pattern of underinvestment. Moreover, there exists a plausible belief that those in positions of authority may exploit their power to augment the scale of investments or partake in irrational financial activities. This could manifest in the deliberate eschewal of projects with a positive net present value, the channeling of resources into unprofitable or high-risk ventures for personal benefits, culminating in patterns of excessive investment behavior (Ibid).

Taken together, through an in-depth study of the pay structure within employee teams, this study hopes to reveal the underlying mechanisms in corporate governance and incentive policies, and to provide new theoretical and empirical support for firms to achieve sustainable development. The research tries to help enterprises better respond to changes in the market environment and promote long-term economic performance. Accordingly, synthesizing the preceding review and analysis of the literature, this study posits the following research hypotheses:

H1: Increasing intra-firm differences in employee compensation levels inhibit firms' TFP, other factors being certain;

H2: Employee compensation discrepancies lead to deviation in investment decisions and inefficient investment, which in turn has a negative impact on firms' *TFP*.

3 EMPIRICAL TESTS

3.1 Sample selection and data sources

This paper constructs its dataset using annual records of A-share listed companies in Shanghai, Shenzhen and Beijing from 2011 to 2022. Data were primarily sourced from the Oriental Wealth CHOICE financial data terminal, and the industry classification adheres to the standards set forth by the Securities and Futures Commission in 2012. To ensure the reliability of the results of the study, the initial sample underwent a series of stringent screening procedures: (1) exclusion of observations with missing data points for the variables under consideration; (2) removal of entities belonging to the financial sector, as these may exhibit distinct financial reporting practices; (3) omission of firms labeled as ST or *ST during the observation period, indicative of peculiar financial circumstances that could skew the analysis. These criteria yielded a refined and reliable analytical sample consisting of 16,316 distinct company-year observations.

3.2 Variable definitions and measurement methods

3.2.1 Explained variable – Firms' total factor productivity (TFP)

① The first method to calculate enterprises' TFP is referred to Olley & Pakes's (1996) regression method: the logarithm of main business revenue is taken ($Ln(Y)$) to represent the output variable, the logarithm of the number of employees in reference to the annual report of the enterprise ($Ln(L)$) to represent the labour inputs, the logarithm of the company's total assets ($Ln(K)$) to serve as the capital inputs, the State denotes the dummy variable of whether or not the enterprise is a state-owned enterprise, the Reg denotes a dummy variable for the region in which the firm is located, Industry denotes a dummy variable for the industry to which the firm belongs, and Year denotes a time dummy variable (Guo, Guo & Zhang, 2023)[8]:

$$LnY_{i,t} = \alpha_0 + \beta_1 LnL_{i,t} + \beta_2 LnK_{i,t} + \sum \gamma_{it} Reg_{i,t} + \sum \theta_{it} Industry_{i,t} + \sum \delta_{it} State_{i,t} + \sum \mu_{it} Year_{i,t} + \varepsilon_{i,t} \quad (1)$$

The formula for TFP hence is further obtained:

$$LnA_{i,t} = LnY_{i,t} - \beta_1 LnL_{i,t} - \beta_2 LnK_{i,t} \quad (2)$$

② The second method adopts fixed effects regression to measure the total factor productivity of enterprises (Jiang, Wumaierjiang & Deng, 2023)[9]. This method introduces the time fixed effect and the individual fixed effect, and regresses the residual term $\varepsilon_{i,t}$ as a proxy for total factor productivity.

$$LnY_{i,t} = \alpha_0 + \beta_1 LnL_{i,t} + \beta_2 LnK_{i,t} + \varepsilon_{i,t} \quad (3)$$

The formula for TFP hence is obtained:

$$LnA_{i,t} = LnY_{i,t} - \beta_1 LnL_{i,t} - \beta_2 LnK_{i,t} \quad (4)$$

3.2.2 Explanatory variable - Degree of intra-firm pay differentials (*WGAP*)

The level of executive compensation is measured by the average compensation of the top three executives, i.e. the "total compensation of the top three executives" as disclosed in the annual report divided by 3. The compensation of ordinary employees is measured by the "cash paid to and for employees" in the statement of cash flows (minus the "total compensation of the top three executives") divided by the number of employees - 3. The internal pay gap estimated in this paper is approximated using the ratio of executive pay to regular employee pay, broadly expressed as the relative pay gap between executives and regular employees, denoted as *WGAP*.

3.2.3 Mediator variable - Investment efficiency (*I_over/I_under*)

This paper refers to Richardson's (2006) residual measure model to measure the investment efficiency of a firm by constructing an expected investment model with the difference between the firm's expected investment and its real investment[10]. Where the residual difference is greater than 0, it indicates that the enterprise has over-investment, and the residual difference is less than 0, it indicates that the enterprise has under-investment. The model is set up as follows:

$$INV_t = \alpha_0 + \alpha_1 * Growth_{t-1} + \alpha_2 * LEV_{t-1} + \alpha_3 * CF_{t-1} + \alpha_4 * ROA_{t-1} + \alpha_5 * Size_{t-1} + \alpha_6 * BM_{t-1} + \alpha_7 * FA_{t-1} + \alpha_8 * INV_{t-1} + \alpha_9 * REV_{t-1} + \alpha_{10} * AGE_{t-1} + \sum Industry + \varepsilon_t \quad (5)$$

In addition to this, the study also refers to previous empirical studies on firms' investment behaviour and business performance to control for other factors that may affect firms' investment behaviour by including firm size (*A*), leverage ratio (*LEV*), net cash flow (*CF*), management shareholding ratio (*MANAGER*), fixed asset ratio (*FA*), book-to-market ratio (*BM*), firm growth (*GROWTH*), and firm age (*AGE*).

3.3 Empirical Modelling

In order to verify the research hypotheses established above, a multiple regression model is first constructed for the direct effect to test the impact of intra-enterprise pay differences on the total factor productivity of enterprises, with the following regression formula:

$$TFP_{i,t} = \beta_0 + \beta_1 WGAP_{i,t-1} + \gamma * ControlVriables_{i,t-1} + \varepsilon_{i,t} \quad (6)$$

Secondly, mediator effect models (7) and (8) are constructed to explore whether firm investment efficiency is a possible transmission mechanism between the enterprise employees' pay gap and firm *TFP*:

$$Inv_{i,t} = \theta_0 + \theta_1 WGAP_{i,t-1} + \gamma * ControlVriables_{i,t-1} + \varepsilon_{i,t} \quad (7)$$

$$TFP_{i,t} = \mu_0 + \mu_1 WGAP_{i,t-1} + \rho_2 Inv_{i,t-1} + \gamma * ControlVriables_{i,t-1} + \varepsilon_{i,t} \quad (8)$$

4 FINDINGS AND ANALYSES

4.1 Descriptive statistics

To count the basic descriptive characteristics of each variable, descriptive statistics analysis was carried out. Table 1 shows the results of descriptive statistics of the main variables, from which it can be seen that: (1) the mean and standard deviation of *WGAP*, a measure of the degree of intra-enterprise pay differences, are 7.867 and 8.393, respectively, indicating that there is a large gap in the pay of employees between the sample companies, and that there exist companies with closer intra-enterprise pay arrangements as well as those with an extremely imbalanced distribution of pay; (2) the standard deviation of *TFP* is small, indicating that the distribution of TFP among the sample companies is more concentrated around the average value, but there is still a large gap between the maximum and minimum values, indicating that the technological innovation capacity among listed companies is different; (3) the gap between the investment efficiency, main business income and year-on-year revenue growth rate of the sample companies in other variables is also extremely large.

Table 1. Results of descriptive statistics

Variables	Sample size	Average	Standard deviation	Minimum	Median	Maximum
WGAP	16316	7.867	8.393	0.008	5.690	395.265
TFP1	16316	3.012	0.631	-4.540	2.985	13.185
TFP2	16316	5.061	0.645	-2.305	5.026	15.469
I_over/I_under	16316	-0.674	1253.007	-9039.704	-73.551	111288.512
A	16316	1589363.255	6567487.008	5408.828	404096.413	219237949.400
LEV	16316	41.955	20.818	0.797	41.273	855.657
ROA	16316	3.964	7.278	-185.912	3.835	87.959
Growth	16316	17.827	132.662	-130.916	9.627	8478.367
FA	16316	20.713	15.350	0.021	17.720	95.418
REV	16316	929200.980	4120505.995	-11485.685	201434.282	161502332.700
CF	16316	4.971	6.905	-65.637	4.751	66.414
BM	16316	0.420	0.284	-1.010	0.353	2.776
AGE	16316	19.128	5.666	2	19	65

4.2 Panel regression analysis

Based on the research hypotheses above, the samples were tested separately for the inclusion of mediator variables, and Table 2 demonstrates the main multiple regression results.

The results of enterprise *TFP* obtained from the regression measurements show that: Column (a) in *TFP1* presents that the degree of pay disparity *WGAP* is significant at the 1% significance level, with a coefficient of -0.0523, which indicates that the increase of pay disparity within the enterprise will have a negative effect, i.e., widening of the horizontal pay disparity will make low-paid employees slack off at work and other behaviors, and the high-paid executives may lose the sense of competition and the pursuit of work excellence, which will finally inhibit the enhancement of corporate *TFP*.

In this study, the robustness test is carried out through the variable substitution method, i.e., the indicator is re-measured by changing the proxy variables to demonstrate the model robustness. The conclusion of the previous hypothesis H1 is further supported by the fact that *WGAP* maintains a negative coefficient and is significant at the 1% significance level when firms' total factor productivity, *TFP2*, measured by the fixed-effects regression, is used as the explanatory variable.

Thereafter, the study added the mediator variable investment efficiency (*I_over/I_under*), and a comparison with the results of the benchmark regression shows that: column (a) shows that the internal gap in pay significantly affects the mediator variable investment efficiency, with a p-value that is significant at the 1% level; column (b) shows that the mediator variable significantly affects the dependent variable *TFP1*, with a p-value that is significant at the 1% level; and additionally, after controlling for the independent variable, and including the mediator variable, the effect of the *WGAP* on the dependent variable *TFP1* was weakened, i.e., the *WGAP* coefficient is -0.0508, whose absolute value is less than 0.0523, which proves that hypothesis H2 is valid.

Table 2. Regression results for testing hypotheses

	TFP1		**TFP2**		**Add the mediator variable Invest**	
	(a)	**(b)**	**(a)**	**(b)**	**(a) (WGAP → Invest)**	**(b) (WGAP + Invest→TFP1)**
WGAP	-0.0523***	-0.0620***	-0.0468***	-0.0567***	188.22***	-0.0508***
MANAGER		-0.0006		-0.0008		
A		-3.738e-09***		-3.239e-09**		
Growth		0.0002***		0.0002***		
FA		0.0003		-0.0003		
LEV		0.0024***		0.0027***		
REV		2.815e-08***		2.944e-08***		
CF		0.0040***		0.0038***		

BM		-0.1604***		-0.1468***		
AGE		-0.0341***		-0.0322***		
Invest	-	-	-	-	-	-7.794e-06***
year	Yes	Yes	Yes	Yes	Yes	Yes
industry	Yes	Yes	Yes	Yes	Yes	Yes
F	40.287	45.133	32.642	47.267	42.350	25.176
R-squared	0.0030	0.0326	0.0024	0.0341	0.0032	0.0037
N	16316	16316	16316	16316	16316	16316

Note: The table shows the coefficient of each variable, ***, **, * represent the coefficient is significant at 1%, 5% and 10% significance level respectively.

5 SUMMARY

5.1 Conclusion

Utilizing panel data from Chinese listed enterprises spanning the years 2011-2022, this study conducts an empirical analysis on the determinants of firm performance and total factor productivity, with a specific emphasis on the wage disparity within companies. The examination hinges on elucidating the mechanisms and pathways through which wage disparities exert their influence. Findings indicate that widening pay differentials enhance competitive effects and engender adverse behavioral consequences, ultimately undermining corporate performance. One plausible interpretation of these findings is that substantial intrafirm pay disparities may catalyze competitive behaviors among employees and give rise to actions that prioritize personal gain over collective interests. Such intrafirm competition and counterproductive behaviors have the potential to erode cooperation and trust, impinge upon collective effort and innovation, and consequently precipitate a deterioration in firm performance. Additionally, wage disparities may impinge upon employee motivation and engagement. The perception of inequitable compensation may culminate in diminished work motivation, reduced active participation, and an incline in counterproductive activities such as passive job disengagement and increased turnover rates, all of which are deleterious to enterprise performance.

The mechanism of action suggests that non-efficient investment mediates between the two, and a possible explanation for this is that it acts as a bridge between efficiency and effectiveness. Specifically, when a significant disparity exists between executive remuneration and the earnings of regular employees, there is a propensity for senior management to prioritize immediate financial outcomes, potentially at the expense of the company's long-term growth and sustainability. This phenomenon can be linked to the incentive structure which may encourage executives to focus on short-term profitability as a means of maximizing their personal compensation. As a consequence, investment decisions may become skewed towards endeavors that promise rapid returns and heightened volatility, while strategic initiatives aimed at cultivating enduring organizational value are unduly disregarded. Such myopic management strategies not

only jeopardize the future prosperity of corporations but also contribute to the exacerbation of socio-economic disparities and the destabilization of societal structures.

5.2 Enlightenment

Enterprises should not underestimate the impact of equity issues when setting up remuneration structures. Firstly, a fair remuneration system can increase employee job satisfaction and morale, which helps to attract and retain talent, and in turn improves the overall performance of the enterprise. Secondly, an unfair remuneration system may lead to dissatisfaction and conflict among employees, reduce work motivation, affect teamwork, and may even lead to legal risks. Hence, in the formulation of remuneration architectures, organizations are compelled to meticulously consider equity to ensure that remuneration is dispensed in a fair and judicious manner. Such consideration is instrumental in facilitating the symbiotic advancement of both the enterprise and its personnel.

On the other hand, when the pay gap increases, executives may underinvest due to lazy psychology, risk aversion, etc., or overinvest by means of political intrigue, etc. The article needs to delve further into what kind of inefficient investment acts as a transmission mechanism between corporate employee pay differentials and corporate *TFP*. This is one of the directions for further research that can be advanced.

REFERENCE

1. Feng, Y.H., Cheng, X.Y. & Liu R.H. (2024). 'Research on the Performance Path of Industrial Green Total Factor Productivity in the Context of High-Quality Development—Based on Fuzzy-Set Qualitative Comparative Analysis', *Sustainability*, 16(1), 412, January 3, 2024. Retrieved from https://doi.org/10.3390/su16010412.
2. Shiue, M.J., Yeh, S.L. & Lu, Y.W. (2022). 'The Influence of Ownership Structure, Corporate Governance and Corporate Social Responsibility on Nonexecutive Employees' Compensation', *China Journal of Accounting Research*, 18(2), pp.167-205. Retrieved from https://doi.org/10.6538/TAR.202212_18(2).0001.
3. Grobler, A., Singh, M. & Plessis, M.D. (2013). 'Differentiation of remuneration within a salary band: An endeavour to establish fairness, transparency and equitable remuneration using a 270° approach by a single-rater group', *ResearchGate*, January 2013. Retrieved from (PDF) Differentiation of remuneration within a salary band: An endeavour to establish fairness, transparency and equitable remuneration using a 270° approach by a single-rater group (researchgate.net).
4. Lam, L. et al. (2022). 'Research: The Unintended Consequences of Pay Transparency', *Harvard Business Review*, August 12, 2022. Retrieved from https://hbr.org/2022/08/research-the-unintended-consequences-of-pay-transparency.
5. Martono, S. et al. (2022). 'Evaluation of the impact of the pay gap on performance - A study of dual system banking', *Cogent Business & Management*, Vol.9, August 21, 2022. Retrieved from https://doi.org/10.1080/23311975.2022.2110646.

6. Zhang, C.Y. & Fan, Q.Q. (2012). 'The Relationship between Internal Salary Gap and Corporate Performance: A Debate between Tournament Theory and Behavioral Theory', *Finance and Accounting Monthly*, September 21, 2012. Retrieved from 9333155.pdf (ckyk.cn).
7. Wei, X.H. (2016). 'Meta analysis of the impact of salary level and salary gap on the operational results of enterprises', *Advances in Psychological Science*, Vol.24, No.7, 1020-1031. DOI: 10.3724/SP.J.1042.2016.01020.
8. Guo, K., Guo, X.M. & Zhang, J. (2023). 'Financial asset allocation duality and enterprise upgrading: empirical evidence from the Chinese A-share market', *Humanities and Social Sciences Communications*, Vol.10, No.237, May 15, 2023. Retrieved from https://doi.org/10.1057/s41599-023-01683-1.
9. Jiang, H., Wumaierjiang, A.S. & Deng, F. (2023). 'Top Management Team Pay Gap, Efficient Investment and Firm Total Factor Productivity', *WANFANG DATA*, July 17, 2023. DOI: 10.3969/j.issn.1004-292X.2023.06.009.
10. Richardson, S. (2006). 'Over-investment of free cash flow', *Review of Accounting Studies*, 11:159–189, June 23, 2006. DOI: 10.1007/s11142-006-9012-1.