



The effects of minimum wage and employment standards on labour investment efficiency: A comparison of state-owned and private companies in China

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ABSTRACT

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This study examines how China's minimum wage and employment standards shape corporate labour investment efficiency, and whether these effects differ between state-owned and private firms. Using panel regression analysis with year- and industry-fixed effects, ownership interactions, and over- and under-employment subsample splits, we analyse 18,575 firm-year observations of companies listed on the Shanghai and Shenzhen stock exchanges between 2010 and 2019. Higher minimum wage standards are associated with lower labour investment efficiency on average, but this penalty weakens in overemployed firms and reverses into an efficiency gain in underemployed firms. Employment size is also negatively associated with labour investment efficiency on average, with a stronger negative effect in state-owned enterprises; however, the association becomes positive among underemployed firms. When a high minimum wage and a large workforce coincide, labour investment efficiency deteriorates in general but improves in underemployed state-owned enterprises. These findings indicate that the effects of labour market regulations depend on ownership structure and the firm's position relative to its optimal employment level. The results suggest that policymakers should avoid uniform labour-market policies and instead consider differentiated approaches to minimum wages and employment standards across ownership types and employment conditions. The study contributes to the labour investment efficiency literature by highlighting the regulatory environment as an important source of cross-firm heterogeneity.

Contribution/ Originality: This study contributes to the existing studies by exploring the time frequency correlation between the eight cryptocurrencies and gold with the stock markets of ASEAN+2 and G5 countries through wavelet coherence analysis. It offers new insights into how these assets co-move with the stock markets across different investment horizons and market regimes, thereby enhancing the understanding of their hedging, diversification and safe haven properties during periods of market turmoil and market stability.

1. INTRODUCTION

Firms pursue value maximization by optimizing every category of investment, and investment in people is unlike investment in machines. Labour absorbs a large, recurring share of operating expenditure; hiring decisions are costly to unwind; and the employment relationship is embedded in contracts whose renegotiation involves conflict costs (Shin, Lee, & Yoon, 2018). A firm that hires too slowly forfeits growth opportunities, while one that hires beyond its

needs carries payroll that produces no marginal output. Labour investment efficiency, how closely actual net hiring tracks the level justified by fundamentals, is therefore a first-order determinant of competitiveness.

Two institutions constrain that choice in most economies. Minimum wage laws set a statutory floor beneath the price of labour, and thus beneath the firm's cost of employing its marginal worker, and employment protection rules limit the firm's ability to shed workers once hired. China offers an unusually powerful laboratory for studying both at once. Regional minimum wages have climbed rapidly and vary widely across provinces; the Labour Contract Law of 2008 sharply curtailed dismissal discretion; and, crucially, the corporate sector is split between state-owned enterprises (SOEs), which shoulder policy burdens such as employment stability, and private firms, which answer chiefly to product and capital markets. As of 2023, roughly 63% of listed Chinese companies were state-owned, a share with few parallels elsewhere. SOEs are widely documented to hoard labour under political pressure (Lin & Li, 2004; Zeng & Chen, 2006), whereas private firms hire and shed workers with far greater flexibility.

Despite this institutional distinctiveness, the existing literature leaves a critical gap. Research on labour investment efficiency has concentrated almost entirely on firm-internal determinants, financial reporting quality (Jung, Lee, & Weber, 2014) accounting conservatism (Ha & Feng, 2018) governance and competition (Kang & Cho, 2017) analyst monitoring (Lee & Mo, 2020) and tax incentives (Jeong & Ki, 2017), while research on China's minimum wage has examined employment and wage outcomes (Jiang & Wang, 2013; Ma, Zhang, & Zhu, 2012; Niu, 2021) without asking what the policy does to the efficiency of firms' labour investment. No study, to our knowledge, has tested how these two labour market institutions interact with one another and with ownership structure to determine labour investment efficiency. Given that SOEs and private firms face the same statutes under radically different objective functions, treating Chinese firms as a homogeneous group is not a simplification but an omission that can reverse policy conclusions. Closing this gap is the purpose of the present study.

We ask three questions. Does a higher regional minimum wage standard raise or lower firms' labour investment efficiency? Does the size of the existing workforce, held in place by the Labour Contract Law, help or hinder efficient labour investment? And do the answers differ between SOEs and private firms, and between firms that are over- versus under-employed relative to fundamentals? Using 18,575 firm-year observations of Shanghai and Shenzhen A-share listed companies over 2010–2019 and the residual-based efficiency measure of Jung et al. (2014) and Pinnuck and Lillis (2007), we estimate panel regressions with ownership interactions and split samples by employment position.

The remainder of the paper is organized as follows. Section 2 reviews the institutional background and related literature and develops the hypotheses. Section 3 describes the research design, variable measurement, and sample. Section 4 reports the empirical results. Section 5 discusses the findings and their implications, and Section 6 concludes with policy suggestions and limitations.

2. THEORETICAL BACKGROUND AND RESEARCH HYPOTHESES

2.1. Institutional Background

China's minimum wage system was announced by the Ministry of Human Resources and Social Security on 24 November 1993, written into labour legislation in 1994, and rolled out nationwide from 11 March 2004 following the Ministry's December 2003 resolution. Minimum wages are set regionally in two forms, a monthly floor for full-time workers and an hourly floor for part-time workers, according to the determination model in Equation 1, which weighs the urban cost of living (C), employee social insurance and housing fund contributions (S), the average monthly wage (A), unemployment (U), the level of economic development (E) and other adjustment factors (a):

$$M = f(C, S, A, U, E, a) \quad (1)$$

The Labour Contract Law, promulgated in 2008, strengthened worker protections by codifying probation periods, contract duration, and wage arrears, and by making dismissal substantially more difficult. The law thus

protects workers' rights while simultaneously raising the cost of adjusting employment downward, a tension at the heart of this study.

2.2. Minimum Wage, Employment and Ownership in China

Chinese evidence on the employment consequences of the minimum wage is mixed. Lin and Yuan (2007) defended the system as a corrective to transition-era wage suppression and rural labour shortages, and as a tool against income polarization. Wang (2010) documented sharp regional heterogeneity: after the system took effect, employment standards and efficiency moved together in some provinces and in opposite directions in others, broadly tracking whether a region imports or exports migrant labour. Industry-level estimates suggest a 10% increase in the minimum wage raised average manufacturing incomes by 0.4–0.5% while cutting employment by about 0.6% (Ma et al., 2012), and province-panel evidence for 1995–2010 points to negative employment effects concentrated in services and manufacturing (Jiang & Wang, 2013). More recently, Niu (2021) identified an inverted U-shape over 2008–2018: employment rises with the minimum wage up to a threshold and falls beyond it, a pattern that held in all macro-regions except the northwest. Ownership matters throughout: because the state assigns SOEs social objectives, they employ more workers at higher labour costs than comparable private firms (Zeng & Chen, 2006), a policy burden that soft budget constraints allow to persist (Lin & Li, 2004).

2.3. Determinants of Labour Investment Efficiency

The labour investment efficiency literature measures efficiency as the gap between actual and expected net hiring, where expected hiring is fitted from fundamentals such as sales growth, profitability, and stock returns (Pinnuck & Lillis, 2007). Studies in this tradition attribute variation in the gap mainly to information and agency frictions. Better financial reporting quality narrows the gap by reducing information asymmetry between managers and outside stakeholders (Jung et al., 2014); timely loss recognition disciplines hiring decisions (Ha & Feng, 2018); accounting quality and product market competition curb managerial opportunism (Kang & Cho, 2017); and analyst coverage acts as external governance, particularly for cash-rich firms (Lee & Mo, 2020). Managerial ability raises efficiency in line with efficient contracting (Fu & Lee, 2018); employment tax credits pull underemployed firms toward their optimal headcount (Jeong & Ki, 2017); and efficient labour investment is priced: it raises firm value and lowers financing costs in Korea (Lee & Yu, 2017) and predicts stock returns in China, more strongly for private and labour-intensive firms (Kong, Xiang, & Dai, 2017). Firm- and region-level conditions matter as well: labour marketization improves efficiency by relieving both over- and under-investment, especially in private and financially constrained firms (Yuan, Yang, & Liu, 2023); employee stock ownership (Adwan, 2024) regional social capital (Chowdhury, Hossain, Rahman, & Zheng, 2025) and ESG disclosure (Silva & Vieira, 2025) each reduce labour investment inefficiency; employee education and tenure raise efficiency while CEO shareholding lowers it, with effects again concentrated in private firms (Kong & Hu, 2019); female executive representation has been linked to more conservative labour investment decisions in China (Qin, Chen, & Fang, 2020); and efficiency interacts with other corporate outcomes such as dividend policy (Lee & Kim, 2018) and the value relevance of accounting numbers (Cho, 2020). What is conspicuously missing from this list is the regulatory environment itself: the statutory price floor under labour and the statutory friction on dismissal.

2.4. Hypothesis Development

Our first hypothesis concerns the minimum wage. In a labour-surplus economy, a binding wage floor raises the cost of the marginal worker without a matching productivity gain: firms absorb larger cash outflows, adjust future hiring plans defensively, and, because a floor compresses rather than restructures the wage distribution, cannot expect offsetting gains in worker effort. The deviation between actual and optimal net hiring should therefore widen as the

regional minimum wage rises. The industry evidence of negative employment responses (Jiang & Wang, 2013; Ma et al., 2012) is consistent with this cost channel. Accordingly:

Hypothesis 1 (H1): The minimum wage standard is negatively associated with labour investment efficiency.

Our second hypothesis concerns the size of the existing workforce. Under the Labour Contract Law, dismissal is costly, so a firm's current headcount is not a free-choice variable but a quasi-fixed stock. The larger that stock, the larger the region of fundamentals over which the firm cannot adjust employment downward, and the longer any deviation from optimal employment persists; overemployment-related cash outflows further reduce the managerial flexibility needed to correct hiring errors. Both mechanisms predict that larger workforces are associated with larger deviations from optimal net hiring—that is, lower efficiency. We recognize a countervailing channel: for firms currently below their optimal employment level, a larger workforce moves the firm toward its optimum and should improve measured efficiency. Rather than leaving the hypothesis agnostic, we state the average prediction directionally and treat the employment position of the firm as the theoretically motivated source of heterogeneity, which our subsample design tests directly.

Hypothesis 2 (H2): Employment size is negatively associated with labour investment efficiency on average, and this association is expected to weaken or reverse in underemployed firms.

Ownership conditions both predictions. SOEs face the two regulations more strictly, carry employment mandates (Lin & Li, 2004; Zeng & Chen, 2006), and start from lower efficiency (Kong et al., 2017), so the marginal effect of each regulation should differ by ownership type. Figure 1 summarizes the framework: the minimum wage standard ($\ln(\text{LC})$, or the high-regime indicator LC_D) and employment size (EMPYSIZE) affect labour investment efficiency directly (H1, H2), while ownership (GOV) moderates both paths through the interaction terms of Equations 4–6, and the high-minimum-wage regime (LC_D) additionally moderates the employment-size path in Equation 6. GOV is thus a moderating variable rather than a mediator.

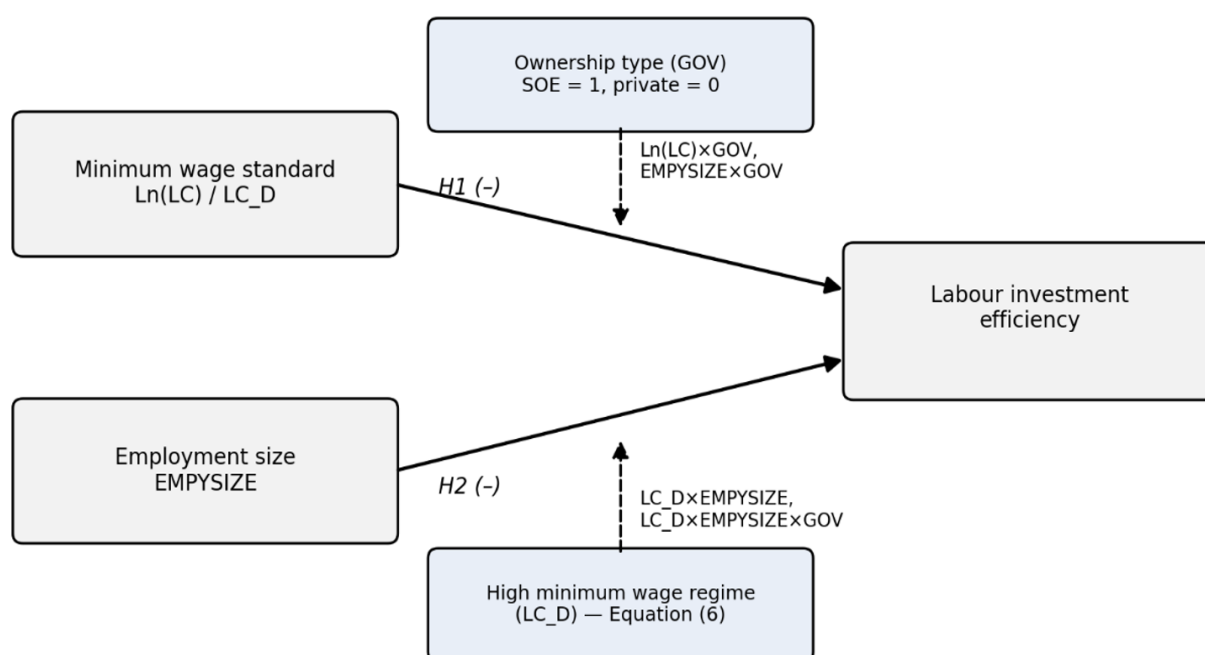


Figure 1. Research framework: direct effects of the minimum wage standard and employment size on labour investment efficiency, moderated by ownership type (GOV) and the high-minimum-wage regime (LC_D).

Note: Solid arrows denote hypothesized direct effects; dashed arrows denote moderation, implemented as the interaction terms in Equations 4–6.

3. RESEARCH MODELS AND DATA

3.1. Measuring Labour Investment Efficiency

The conceptual model in Equation 2 relates efficiency to the two regulatory variables, ownership, and their interactions.

$$Efficiency = f(Ln(LC), EMPYSIZE, GOV, Ln(LC) \times GOV, EMPYSIZE \times GOV) \quad (2)$$

To operationalize the dependent variable, and following Pinnuck and Lillis (2007) and Jung et al. (2014), expected net hiring is fitted from fundamentals in Equation 3: The percentage change in employees (NET_HIRE) is regressed on contemporaneous and lagged sales growth, profitability levels and changes, stock returns, size, liquidity, leverage, loss-bin indicators, and year and industry effects.

$$\begin{aligned} NET_HIRE_{it} = & \alpha_0 + \alpha_1 SALES_GROWTH_{it-1} + \alpha_2 SALES_GROWTH_{it} + \alpha_3 \Delta ROA_{it} + \alpha_4 \Delta ROA_{it-1} + \\ & \alpha_5 ROA_{it} + \alpha_6 RETURN_{it} + \alpha_7 SIZE_{it-1} + \alpha_8 QUICK_{it-1} + \alpha_9 \Delta QUICK_{it-1} + \alpha_{10} \Delta QUICK_{it} + \alpha_{11} LEV_{it-1} + \\ & \alpha_{12} LOSSBIN1_{it-1} + \alpha_{13} LOSSBIN2_{it-1} + \alpha_{14} LOSSBIN3_{it-1} + \alpha_{15} LOSSBIN4_{it-1} + \alpha_{16} LOSSBIN5_{it-1} + \\ & \beta \Sigma YD + \beta \Sigma IND + \varepsilon_{it} \quad (3) \end{aligned}$$

Where NET_HIRE is the percentage change in the number of employees; SALES_GROWTH is the percentage change in sales revenue; ROA is net income over beginning-of-year assets; RETURN is the annual stock return; SIZE is the natural logarithm of beginning-of-year equity market value; QUICK is the quick ratio; LEV is total debt over total assets; LOSSBIN1–LOSSBIN5 are indicators equal to 5 when prior-year ROA falls in successive intervals of width 0.005 from 0 to −0.025, and 0 otherwise; and YD and IND are year and industry dummies.

Definition of Efficiency: The residual ε from Equation 3 is the firm's abnormal net hiring. Our dependent variable is defined as Efficiency = $-|\varepsilon|$: the negative of the absolute residual. By construction, Efficiency is at most zero; a value closer to zero indicates that actual hiring tracked expected hiring closely (high efficiency), and a more negative value indicates a larger deviation in either direction (greater inefficiency). The *sign* of the underlying residual, before taking the absolute value, is used only to classify firms: firm-years with $\varepsilon > 0$ (actual net hiring above the fitted level) form the overemployed subsample, and firm-years with $\varepsilon < 0$ form the underemployed subsample. Thus, a negative Efficiency value does not itself signal underemployment; it signals inefficiency, whose direction is captured by the subsample classification. Throughout the tables, Efficiency (+) denotes the overemployed (positive-residual) subsample and Efficiency (−) the underemployed (negative-residual) subsample.

3.2. Research Models

Three estimating equations implement the conceptual model. Equation 4 tests H1, with the regional average minimum wage in logs (Ln(LC)) and its ownership interaction; Equation 5 tests H2, with employment size (EMPYSIZE) and its ownership interaction; Equation 6 examines the joint regime, interacting a high-minimum-wage indicator (LC_D) with employment size and ownership up to the triple interaction. The ownership interactions are included because the Labour Contract Law binds SOEs more tightly than private firms and because SOEs account for a large share of listed companies. All models are estimated by pooled ordinary least squares with year- and industry-fixed effects, and controls follow prior studies: firm size (SIZE), leverage (LEV), liquidity (LIQD), profitability (ROA), and market-to-book (MTB).

$$\begin{aligned} Efficiency_{it} = & \beta_0 + \beta_1 Ln(LC)_{it} + \beta_2 GOV_{it} + \beta_3 Ln(LC)_{it} \times GOV_{it} + \beta_4 SIZE_{it-1} + \beta_5 LEV_{it-1} + \\ & \beta_6 LIQD_{it-1} + \beta_7 ROA_{it-1} + \beta_8 MTB_{it} + \beta \Sigma YD + \beta \Sigma IND + \varepsilon_{it} \quad (4) \end{aligned}$$

$$\begin{aligned} Efficiency_{it} = & \delta_0 + \delta_1 EMPYSIZE_{it} + \delta_2 GOV_{it} + \delta_3 EMPYSIZE_{it} \times GOV_{it} + \delta_4 SIZE_{it-1} + \delta_5 LEV_{it-1} + \\ & \delta_6 LIQD_{it-1} + \delta_7 ROA_{it-1} + \delta_8 MTB_{it} + \delta \Sigma YD + \delta \Sigma IND + \varepsilon_{it} \quad (5) \end{aligned}$$

$$\begin{aligned} Efficiency_{it} = & \varphi_0 + \varphi_1 EMPYSIZE_{it} + \varphi_2 GOV_{it} + \varphi_3 LC_D_{it} + \varphi_4 EMPYSIZE_{it} \times LC_D_{it} + \\ & \varphi_5 LC_D_{it} \times GOV_{it} + \varphi_6 EMPYSIZE_{it} \times GOV_{it} + \varphi_7 EMPYSIZE_{it} \times GOV_{it} \times LC_D_{it} + \varphi_8 SIZE_{it-1} + \\ & \varphi_9 LEV_{it-1} + \varphi_{10} LIQD_{it-1} + \varphi_{11} ROA_{it-1} + \varphi_{12} MTB_{it} + \varphi \Sigma YD + \varphi \Sigma IND + \varepsilon_{it} \quad (6) \end{aligned}$$

Variable definitions: Efficiency = $-|\text{residual}|$ from Equation 3; Ln(LC) = natural logarithm of the regional average minimum wage; LC_D = 1 for firm-years in the top quartile of the minimum-wage standard and 0 for the bottom quartile; GOV = 1 for state-owned companies and 0 for private companies; EMPYSIZE = natural logarithm of the number of employees; SIZE = natural logarithm of total assets; LEV = total debt over total assets; LIQD =

current assets over current liabilities; ROA = net income over beginning-of-year total assets; MTB = market value over book value; YD and IND = year and industry dummies.

3.3. Sample Selection

The sample consists of Chinese A-share companies listed on the Shanghai and Shenzhen stock exchanges from 2010 to 2019, with financial data drawn from the CSMAR database. These markets have been open to qualified foreign institutional investors since 2003, which has strengthened price informativeness and governance quality (Meng, Xiong, Xiao, & Bai, 2023). Firm-years are retained if they (1) have a 31 December fiscal year-end and fall outside the financial and ST sectors; (2) are not capital-impaired; and (3) employ at least 30 workers. The resulting panel contains 18,575 firm-year observations, weighted toward information transmission, software, and IT services. All continuous variables are winsorized at the 1st and 99th percentiles. The regression sample for Equations 4–6 comprises 12,770 firm-years with complete lagged covariates and non-missing quartile classification of the minimum wage standard (LC_D retains only top- and bottom-quartile firm-years); of these, 3,976 are classified as overemployed (positive abnormal hiring) and 8,794 as underemployed (negative abnormal hiring) by the residual-sign rule defined in Section 3.1.

4. EMPIRICAL ANALYSIS RESULTS

4.1. Descriptive Statistics and Correlations

Table 1 presents descriptive statistics. Efficiency has a mean of -0.3501 and a median of -0.2553 over the range $[-2.0050, -0.0049]$; by construction, all values are negative, with values nearer zero indicating more efficient labour investment. The overemployed subsample, Efficiency (+), averages -0.3619 and the underemployed subsample, Efficiency (−), averages -0.3446 . The regional minimum wage in logs, $\text{Ln}(\text{LC})$, averages 11.1064 within $[10.3311, 12.0246]$, and employment size (EMPYSIZE) averages 7.7237 within $[5.2684, 11.0757]$. State-owned firms account for 36.98% of the sample. Among the controls, firm size (SIZE) averages 22.0838 within $[19.8130, 25.0761]$; leverage (LEV) averages 0.4207 ; liquidity (LIQD), 2.1303 ; ROA averages 0.5194 ; and market-to-book (MTB) averages 0.9385 .

Table 1. Descriptive statistics of major variables (N = 18,575).

Category	Variables	Mean	STD	Min.	Q1	Median	Q3	Max.
Labour Investment Efficiency	Efficiency	−0.3501	0.3401	−2.0050	−0.4730	−0.2553	−0.1155	−0.0049
	Efficiency (+)	−0.3619	0.4478	−2.0050	−0.4391	−0.2000	−0.0805	−0.0049
	Efficiency (−)	−0.3446	0.2760	−2.0050	−0.4833	−0.2767	−0.1377	−0.0049
	$\text{Ln}(\text{LC})$	11.1064	0.3739	10.3311	10.8325	11.1075	11.3467	12.0246
	EMPYSIZE	7.7237	1.1696	5.2684	6.9089	7.6305	8.4206	11.0757
	GOV	0.3698	0.4827	0	0	0	1	1
	SIZE	22.0838	1.0801	19.8130	21.3214	22.0396	22.7601	25.0761
	LEV	0.4207	0.2123	0.0469	0.2474	0.4108	0.5820	0.9079
	LIQD	2.1303	2.7517	0.1686	0.7255	1.2294	2.2699	17.7724
	ROA	0.5194	0.6595	−1.1463	0.1277	0.3730	0.7534	3.3314
	MTB	0.9385	0.9553	0.0973	0.3524	0.6111	1.1300	5.4043

Note: Efficiency = $-|\text{residual}|$ from Equation 3, so all values are non-positive, and values closer to zero denote higher efficiency. Efficiency (+) is the overemployed (positive-residual) subsample and Efficiency(−) the underemployed (negative-residual) subsample. $\text{Ln}(\text{LC})$ = log regional average minimum wage; EMPYSIZE = log number of employees; GOV = 1 for state-owned firms; SIZE = log total assets; LEV = total debt/total assets; LIQD = current assets/current liabilities; ROA = net income/beginning total assets; MTB = market-to-book ratio.

Table 2 reports Pearson correlations. Efficiency correlates positively with $\text{Ln}(\text{LC})$ (0.090) and LC_D (0.045) and negatively with EMPYSIZE (−0.060), all at the 1% level; GOV, SIZE, LEV, and ROA correlate negatively, and MTB positively, with Efficiency. The moderate magnitudes suggest multicollinearity is not a concern for the multivariate analysis.

Table 2. Pearson correlation analysis.

Variables	Efficiency	Ln(LC)	LC_D	EMPYSIZE	GOV
Ln(LC)	0.090***				
LC_D	0.045***	0.741***			
EMPYSIZE	-0.060***	-0.104***	-0.065***		
GOV	-0.020**	-0.090***	-0.034***	0.298***	
SIZE	-0.045***	0.180***	0.069***	0.533***	0.301***
LEV	-0.055***	-0.071***	-0.047***	0.342***	0.330***
LIQD	0.010	-0.005	0.019***	-0.290***	-0.241***
ROA	-0.023***	0.033***	0.045***	0.155***	-0.091***
MTB	0.017*	0.013*	0.032***	0.379***	0.350***
Variables	SIZE	LEV	LIQD	ROA	
LEV	0.280***				
LIQD	-0.262***	-0.631***			
ROA	0.144***	-0.162***	0.145***		
MTB	0.216***	0.617***	-0.303***	-0.104***	

Note: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively. See Table 1 for variable definitions.

4.2. Univariate Analysis

Table 3 compares group means. Efficiency averages -0.3587 for SOEs against -0.3449 for private firms, an absolute gap of 0.0138 ($p < 0.05$), so state ownership is associated with less efficient labour investment, consistent with employment mandates that override efficiency considerations and with SOEs' limited flexibility in hiring and dismissal. Sorting instead by wage regime, firms in the top quartile of the minimum wage standard ($LC_D = 1$) average -0.3268 against -0.3600 in the bottom quartile, a difference of 0.0332 ($p < 0.01$) in favour of the high-wage group; unconditionally, higher minimum wage regions thus display *more* efficient labour investment, foreshadowing the importance of conditioning on firm characteristics in the regressions. The average log minimum wage is 0.0699 lower for SOEs (11.0624) than for private firms (11.1323 , $p < 0.01$), indicating that SOEs cluster in lower-wage regions.

Table 3. Univariate tests of mean differences.

Variables	GOV=1 (A)	GOV=0 (B)	Diff. (A-B)	LC_D=1 (A)	LC_D=0 (B)	Diff. (A-B)
Efficiency	-0.3587	-0.3449	0.0138**	-0.3268	-0.3600	-0.0332***
Ln(LC)	11.0624	11.1323	0.0699***			

Note: ** and *** denote significance at the 5% and 1% levels (two-tailed). See Table 1 for variable definitions.

4.3. Regression Results

Minimum wage and efficiency (H1): Table 4 reports Equation 4. In the full sample (Model 1), $\text{Ln}(\text{LC})$ enters at -0.0518 ($p < 0.01$): conditional on firm characteristics, a higher regional minimum wage is associated with lower labour investment efficiency, supporting H1 and reversing the unconditional correlation of Table 2. The interaction $\text{Ln}(\text{LC}) \times \text{GOV}$ is positive (0.0334 , $p < 0.05$), so the efficiency penalty is milder for SOEs, plausibly because SOE pay floors already sit near statutory minima in the lower-wage regions where SOEs concentrate (Table 3). In the overemployed subsample (Model 2), the pattern repeats with larger magnitudes ($\text{Ln}(\text{LC})$: -0.0840 , $p < 0.05$; $\text{Ln}(\text{LC}) \times \text{GOV}$: 0.0831 , $p < 0.10$). In the underemployed subsample (Model 3), the sign flips: $\text{Ln}(\text{LC})$ enters at $+0.0300$ ($p < 0.05$) with no significant ownership difference, indicating that where firms employ too few workers, a rising wage floor accompanies *improved* efficiency, consistent with wage floors drawing hiring toward the optimum. Among controls, SIZE, LEV and LIQD carry negative and MTB positive coefficients in the full sample.

Table 4. Effect of the minimum wage standard on labour investment efficiency (Equation 4).

Dependent Variable =Efficiency	Model 1		Model 2 (Overemployed)		Model 3 (Underemployed)	
	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.
Intercept	0.0803	0.48	0.7030*	1.70	0.2064	1.34
Ln(LC)	-0.0518***	-3.73	-0.0840**	-2.51	0.0300**	2.33
GOV	-0.3527*	-1.87	-0.9059*	-1.78	0.0395	0.23
Ln(LC)×GOV	0.0334**	1.99	0.0831*	1.83	-0.0047	-0.31
SIZE	-0.0060*	-1.84	-0.0249***	-2.92	0.0025	0.85
LEV	-0.1755***	-7.33	-0.1391**	-2.28	0.1865***	8.61
LIQD	-0.0036**	-2.51	-0.0061*	-1.79	0.0019	1.44
ROA	0.0010	0.22	0.0007	0.07	-0.0028	-0.61
MTB	0.0235***	5.25	0.0599***	5.03	-0.0072*	-1.80
ΣYD (year dummies)	Included					
ΣIND (industry dummies)	Included					
F-statistic	30.86***		4.99***		44.57***	
Adj. R ²	0.1723		0.0795		0.3036	
Observations	12,770		3,976		8,794	

Note: ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively; the second column of each model reports t-statistics. Model 1 uses the full regression sample; Models 2 and 3 use the overemployed ($\varepsilon > 0$) and underemployed ($\varepsilon < 0$) subsamples defined in Section 3.1. See Table 1 for variable definitions.

Employment size and efficiency (H2): Table 5 reports Equation 5. In the full sample, EMPYSIZE enters at -0.0116 ($p < 0.01$), and EMPYSIZE×GOV at -0.0161 ($p < 0.01$): larger workforces are associated with lower efficiency on average, and the drag is amplified in SOEs, supporting the directional statement of H2 and echoing the policy-burden account of Lin and Li (2004) and the flexibility account of Zeng and Chen (2006). The heterogeneity predicted by H2 also materializes: neither term is significant among overemployed firms (Model 2), whereas among underemployed firms (Model 3), both EMPYSIZE (0.0271 , $p < 0.01$) and EMPYSIZE×GOV (0.0093 , $p < 0.10$) turn positive, headcount growth in understaffed firms moves them toward the optimum, and does so most clearly in SOEs, consistent with the expectation that SOEs contribute disproportionately to job creation.

Table 5. Effect of the employment standard on labour investment efficiency (Equation 5).

Dependent Variable =Efficiency	Model 1		Model 2 (Overemployed)		Model 3 (Underemployed)	
	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.
Intercept	-0.5864***	-6.90	-0.2400	-1.10	0.6799***	8.76
EMPYSIZE	-0.0116***	-2.73	0.0106	1.01	0.0271***	6.96
GOV	0.1492***	3.45	0.2134*	1.82	-0.0882**	-2.27
EMPYSIZE×GOV	-0.0161***	-3.01	-0.0244	-1.64	0.0093*	1.94
SIZE	0.0029	0.78	-0.0267***	-2.79	-0.0135***	-3.91
LEV	-0.1637***	-6.83	-0.1452**	-2.37	0.1627***	7.53
LIQD	-0.0039***	-2.70	-0.0056	-1.62	0.0029**	2.19
ROA	0.0047	0.96	-0.0001	-0.01	-0.0093**	-2.02
MTB	0.0329***	6.99	0.0645***	5.21	-0.0195***	-4.64
ΣYD (year dummies)	Included					
ΣIND (industry dummies)	Included					
F-statistic	31.13***		4.94***		45.98***	
Adj. R ²	0.1736		0.0785		0.3104	
Observations	12,770		3,976		8,794	

Note: ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively; the second column of each model reports t-statistics. Models as in Table 4. See Table 1 for variable definitions.

The joint regime (Equation 6): Table 6 interacts the high-minimum-wage indicator with employment size and ownership. In the full sample, LC_D (-0.0957 , $p < 0.10$) and EMPYSIZE (-0.0153 , $p < 0.01$) are again adverse, and neither LC_D×GOV nor EMPYSIZE×GOV is significant. The positive LC_D×EMPYSIZE term (0.1880 , $p < 0.05$) shows that within high-wage regimes, larger employment is less damaging; the negative triple interaction

LC_D×EMPYSIZE×GOV (−0.0229, $p < 0.05$) shows that this mitigation does not extend to SOEs that combine high wages with large workforces. Among overemployed firms (Model 2), coefficients retain their signs but lose significance. Among underemployed firms (Model 3), EMPYSIZE (0.0303, $p < 0.01$) and the triple interaction (0.0269, $p < 0.01$) are positive: in understaffed SOEs facing high wage floors, expanding employment raises labour investment efficiency, the clearest instance of regulatory complementarity in our results.

Table 6. Joint effect of a high minimum wage regime and employment standards on labour investment efficiency (Equation 6).

Dependent Variable = Efficiency	Model 1		Model 2 (Overemployed)		Model 3 (Underemployed)	
	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.
Intercept	−0.5780***	−6.62	−0.2267	−1.01	0.6805***	8.55
LC_D	−0.0957*	−1.73	−0.0895	−0.68	0.0846	1.61
EMPYSIZE	−0.0153***	−3.23	0.0068	0.56	0.0303***	7.00
GOV	0.0716	1.33	0.1466	0.99	0.0027	0.06
LC_D×EMPYSIZE	0.1880**	2.22	0.0093	0.52	−0.0089	−1.30
LC_D×GOV	−0.0067	−1.00	0.1642	0.73	−0.2238***	−2.91
EMPYSIZE×GOV	0.0103	1.40	−0.0158	−0.84	−0.0017	−0.29
LC_D×EMPYSIZE×GOV	−0.0229**	−2.17	−0.0216	−0.75	0.0269***	2.82
SIZE	0.0036	0.96	−0.0262***	−2.73	−0.0144***	−4.16
LEV	−0.1666***	−6.93	−0.1462**	−2.38	0.1674***	7.73
LIQD	−0.0040***	−2.77	−0.0057	−1.64	0.0030**	2.27
ROA	0.0048	0.99	0.0005	0.04	−0.0091**	−1.97
MTB	0.0328***	6.94	0.0636***	5.11	−0.0199***	−4.72
ΣYD (year dummies)	Included					
ΣIND (industry dummies)	Included					
F-statistic	29.93***		4.74***		44.20***	
Adj. R ²	0.1740		0.0781		0.3113	
Observations	12,770		3,976		8,794	

Note: ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively; the second column of each model reports t-statistics. LC_D = 1 (0) for top (bottom) quartile of the minimum wage standard. Models as in Table 4. See Table 1 for variable definitions.

5. DISCUSSION

Taken together, the results portray labour regulation in China as neither uniformly harmful nor uniformly benign: its efficiency consequences are *contingent* on ownership, on the firm's position relative to optimal employment, and on the interaction between the two policy levers. Three readings follow. First, the average efficiency cost of a higher wage floor (H1) operates through the cash-flow channel anticipated in Section 2.4, but it is a cost borne mainly by firms already carrying excess labour; for understaffed firms, the same floor operates as a correction device, pulling hiring toward fundamentals. Second, the average drag of workforce size (H2) is best understood as a dismissal-rigidity effect of the Labour Contract Law: headcount is quasi-fixed, so large workforces lock in deviations—except where the deviation is a shortfall, in which case growth is the remedy rather than the disease. Third, the joint-regime results reveal a policy complementarity unique to the state sector: high wage floors and employment expansion, each adverse in isolation, jointly raise efficiency in underemployed SOEs, suggesting that SOEs absorb regulation productively precisely where their mandate (hiring) coincides with their need (understaffing).

These findings extend the labour investment efficiency literature, which has located the drivers of efficiency inside the firm, reporting quality, governance, and managerial traits (Fu & Lee, 2018; Jung et al., 2014; Kong et al., 2017), by showing that the regulatory environment shifts efficiency, with signs that flip across institutional settings. They also qualify the China minimum wage literature (Jiang & Wang, 2013; Ma et al., 2012; Niu, 2021): employment quantity responses do not translate one-for-one into efficiency responses, because efficiency depends on the distance from optimal employment, not on employment itself.

6. CONCLUSION AND POLICY SUGGESTIONS

This study examined how China's two central labour market institutions, the minimum wage system implemented nationwide in 2004 and the Labour Contract Law of 2008, affect the labour investment efficiency of listed firms and how those effects differ between state-owned and private companies. Using 18,575 firm-year observations for 2010–2019 and panel regressions with ownership interactions and employment-position subsamples, we find: (1) higher minimum wage standards are associated with lower efficiency on average, with the penalty muted in SOEs and reversed in underemployed firms; (2) larger workforces are associated with lower efficiency on average, most strongly in SOEs, but with higher efficiency in underemployed firms; and (3) the combination of high wage floors and large workforces damages efficiency in general yet improves it in underemployed SOEs.

The policy implications are correspondingly differentiated, and we state them directly. Because regulatory impacts are contingent and heterogeneous, uniform nationwide tightening is the wrong instrument. For the state sector, where employment already sits at high levels, further raising employment standards would reduce labour investment efficiency, whereas raising the (currently low) effective wage floors of SOEs would improve it. For the private sector, the prescription inverts: minimum wage increases carry efficiency costs there, while employment flexibility should be preserved. An employment policy that differentiates by ownership, and, ideally, by firms' employment position, would therefore raise aggregate labour investment efficiency in an economy where the state sector accounts for a majority of listed firms. More broadly, the results caution regulators in any economy with a large state-owned sector against evaluating labour market rules by their average effects alone.

Four limitations qualify these conclusions and chart future research. The sample excludes special administrative regions, and officially announced provincial minimum wages may deviate from effective local floors. The window (2010–2019) begins after both institutions were in place, so implementation-period dynamics are not observed. Listed firms may respond differently from unlisted small and medium-sized enterprises, limiting generalizability. Finally, the design does not fully resolve endogeneity from reverse causality or omitted variables; instrumenting regional wage floors and exploiting staggered policy changes are natural next steps.

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