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RESEARCH ARTICLE

Employee Stock Ownership Plans and Debt Default Risk in China: Role of Operational Efficiency and Information Transparency

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ABSTRACT

The Employee Stock Ownership Plan (ESOP) has emerged as a key corporate governance tool, though its adoption in China was initially constrained by regulatory challenges and an underdeveloped securities market. While ESOPs have evolved to align with governance frameworks, concerns about excessive leverage and speculation highlight the need to assess their impact on financial stability. This study examines the impact of ESOPs on debt default risk (EDF) among Chinese-listed firms, emphasizing the mediating roles of operational efficiency and information transparency. Using panel data from the Shanghai and Shenzhen A-share markets (2014–2020) and a fixed-effects model, the findings reveal that ESOP adoption significantly reduces corporate default risk by strengthening governance mechanisms and aligning managerial incentives. ESOPs also improve operational efficiency, reflected in higher return on equity (ROE), and enhance information transparency, as indicated by increased Information Disclosure Transparency Scores (IDTS). The study expands corporate finance literature by demonstrating ESOPs' role in mitigating default risk beyond traditional incentive structures. Practically, it highlights ESOPs as a strategic governance tool that enhances financial stability and investor confidence. Policymakers may consider regulatory support for ESOP implementation to reinforce corporate governance and financial sustainability. However, the study's focus on Chinese-listed firms may limit generalizability. Future research should explore ESOPs in different regulatory environments and examine moderating factors such as macroeconomic conditions. Overall, this study underscores the importance of ESOPs in reducing corporate financial distress, offering valuable insights for scholars, practitioners, and policymakers.

Contribution/Originality: This study contributes to the existing literature by examining the impact of Employee Stock Ownership Plans on debt default risk in

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Chinese-listed firms. This study uses new estimation methodology involving a two-step mediation framework and documents how ESOPs enhance operational efficiency and information transparency to reduce corporate financial distress and default risk.

1. Introduction

In the ever-evolving corporate landscape, companies constantly seek strategies to align employee interests with organizational goals. One such strategy, the Employee Stock Ownership Plan (ESOP), has emerged as a powerful tool that not only empowers employees but also reshapes corporate governance. Conceived by Kelso in 1956 as an employee retirement benefit plan in the United States, ESOP quickly gained momentum with legislative backing, enabling major firms like Procter & Gamble and Sears to adopt it as both a retirement safety net and a long-term incentive program for employees (Wang, X. et al., 2023). By transforming employees into partial owners, ESOP bridges the gap between employees and enterprise owners, fostering engagement and accountability. Moreover, ESOP offers firms an alternative financing channel, enhancing their resilience in turbulent economic conditions (Zhang et al., 2023; Ren et al., 2019).

China's adoption of ESOP occurred later than in other countries due to its relatively immature securities market and regulatory challenges (Li & Ding, 2020; Shi, 2020). Although ESOP's development has faced setbacks, it has gradually adapted to China's national conditions, adjusting its structure and policies to align with corporate governance goals (Cheng et al. 2024; Gao et al., 2019; Pan & Xu, 2023). Initially designed to improve employee welfare and corporate governance (Wang, W. et al., 2023), ESOP's implementation in China has sometimes involved excessive leverage and speculative behaviors, raising concerns about financial stability (Cao & Chen, 2019; Wang, 2021). These issues underscore the need to examine ESOP's potential impact on debt default risk.

Debt default risk refers to the likelihood of a firm failing to meet its debt obligations (Gao et al., 2024). Rising debt default risks in China have been exacerbated by structural economic imbalances, over-reliance on leverage, and tightening financial regulations (Guo, 2023; Lei, 2023; Huang, 2024). Since 2014, corporate defaults have surged significantly, with defaulted bonds growing over 120 times in scale and balance default rates exhibiting an upward trajectory (Ding et al., 2021; Ding et al., 2023).

In Cheng et al. (2024), ESOPs have been shown to reduce corporate debt levels, which can directly decrease the risk of debt default. This debt reduction is attributed to the optimization of capital structure decisions, where ESOPs accelerate the downward adjustment of capital structure, particularly in non-state-owned companies and high-tech firms. This supports Campa and Kern (2020) asserting the presence of ESOPs is associated with a lower cost of debt, which implies a reduced financial risk perception by external fund providers among S&P 500 firms. This reduction in perceived risk can contribute to a more stable financial condition, thereby mitigating debt default risk.

However, equity incentives, including ESOPs, can have varying effects on debt default risk. This impact is contingent upon several factors, including the macroeconomic environment and industry characteristics. ESOPs are more effective in reducing debt levels during economic booms and in competitive industries (Cheng et al., 2024). Furthermore, Wang (2024) concluded that a large proportion of equity incentives

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relative to total share capital can increase the credit burden on companies, potentially raising debt default risk. Conversely, managerial ownership through equity incentives can decrease debt default risk by promoting financial stability.

Despite evidence suggesting ESOP's role in reducing debt levels and stabilizing financial risk, the precise mechanisms through which ESOP influences debt default risk remain underexplored. While existing literature highlights ESOP's influence on agency costs, innovation performance, and corporate performance, limited studies have examined the specific roles of Operational Efficiency and Information Transparency in this context. Operational efficiency is a crucial factor in improving firm performance through better resource allocation, enhanced productivity, and reduced operational costs (Ren et al., 2019; Handoyo et al., 2023).

ESOPs can significantly enhance operational efficiency by aligning employee interests with those of the company, effectively reducing agency costs and fostering productivity. Drawing on Agency Cost Theory, ESOPs mitigate conflicts of interest between managers and shareholders by incentivizing employees to prioritize organizational goals. This alignment establishes a shared sense of ownership, encouraging employees to adopt value-maximizing behaviors such as improved resource allocation, streamlined processes, and enhanced cost control. As a result, firms experience improved operational outcomes, contributing to financial stability and lowering the risk of debt default (Wang, W. et al., 2023). Improved operational efficiency also reduces wasteful spending and mitigates risks linked to excess cash flow, which can otherwise elevate agency costs (Sajid et al., 2023). Consequently, ESOP-driven improvements in operational efficiency reinforce financial stability and reduce the likelihood of debt default.

Likewise, operational efficiency acts as a mediator in various financial relationships, such as between fintech products and bank risk-taking behavior, indicating its potential role in mediating the relationship between ESOPs and debt default risk (Sajid et al., 2023). This mediating effect is also evident in its influence on profitability, which indirectly affects financial performance and risk management. This suggests that operational efficiency could similarly mediate the impact of ESOPs on debt default risk by improving financial outcomes (Kurniasih & Akhmadi, 2024).

While some studies suggest a relationship between operational efficiency, ESOP, and default risk, others indicate that the relationship is more nuanced, influenced by factors such as credit risk management and governance structures. In Indian banks, Kanoujiya and Rastogi (2024) found bank efficiency to have no significant effect on default risk, suggesting that operational efficiency does not directly mitigate default risk in this context. This finding is surprising and indicates that other factors may play a more critical role in influencing default risk in Indian banks. Similarly, operational efficiency was found to negatively affect firm performance in some banking contexts, indirectly increasing the risk of debt default (Kepramareni et al., 2022; Kadek, 2022).

Meanwhile, information transparency plays a pivotal role in improving corporate disclosure practices, reducing information asymmetry, and fostering investor confidence (Wang, G. et al., 2023; Fang, 2024). Transparency can lead to improved bond prices and a shift towards noncontingent debt, according to Guler et al. (2022). However, this can also increase the frequency of defaults, as higher debt levels are associated with greater default risk in the Bolivian economy context. Moreover, enhanced information

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transparency can decrease default risk by improving the quality of information available to investors. For instance, digital information disclosure in China's A-share market has been shown to reduce default risk, especially when investor sentiment is negative (Zheng, 2024).

In a broader context, transparency is crucial for financial stability, as it reduces information asymmetry, which is a root cause of market inefficiencies and crises. Regulatory measures like the Dodd-Frank Act have emphasized transparency to prevent financial crises (Sharma, 2024). Also, it can increase vulnerability to changes in market expectations. Precise information can amplify the reaction of default risk to shifts in sentiment, particularly for weaker banks (Brancati & Macchiavelli, 2015).

Existing research highlights the potential benefits of ESOP in enhancing corporate governance and improving financial stability. However, the direct influence of ESOP on debt default risk remains ambiguous. While operational efficiency and information transparency are generally linked to improved financial outcomes, their roles as mediators in the ESOP-debt default risk relationship remain underexplored. Additionally, previous studies reveal mixed findings regarding operational efficiency's impact on default risk, suggesting the presence of moderating factors such as governance structures and economic conditions. Similarly, transparency's potential to inadvertently increase default risk under certain conditions underscores the need for a nuanced investigation. This gap calls for further empirical examination of the mediating roles of operational and information efficiencies to understand how ESOP implementation influences firms' financial stability.

This study aims to investigate the impact of ESOP on debt default risk in Chinese firms by examining the mediating roles of operational efficiency and information transparency. By integrating these mediating factors, the study seeks to provide a comprehensive understanding of how ESOP may influence financial stability. This study offers a novel contribution by exploring the dual mediating roles of operational efficiency and information transparency, which have received limited attention in the ESOP-debt default risk literature. It also addresses the contextual gap by focusing on Chinese firms, which operate in a unique regulatory and economic environment where ESOP adoption is still evolving. Furthermore, the study provides insights into the conditions under which ESOP may either mitigate or exacerbate debt default risk, offering practical implications for corporate governance, risk management, and policy-making in China.

2. Research Methods

2.1. Data and sample

This study focuses on listed companies in China's Shanghai and Shenzhen A-share markets from 2014 to 2020. The A-share market was chosen for its extensive scope, encompassing diverse industries and serving as a major component of China's stock market. While the Beijing Stock Exchange (BSE) primarily caters to innovative small and medium-sized enterprises (SMEs), its smaller scale led this study to focus primarily on data from the Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE).

Data for this study were obtained from the China Stock Market and Accounting Research (CSMAR) database. The CSMAR database is recognized for its comprehensive financial

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data series, such as the China Stock Market Trading Database and the China Listed Companies M&A and Reorganization Research Database. This resource was chosen due to its extensive firm-level data, accessibility, and reliability (Zhu & Manansala, 2024; Wang et al., 2023; Cheng et al., 2024).

The study originally collected 18,988 observations from the CSMAR database. To ensure data quality and consistency, several exclusions were applied, including the removal of financial industry firms, firms with missing values for key research variables, and firms classified as ST, *ST, or PT to avoid entities under special treatment for financial distress (Zhu & Manansala, 2024; Cao & Chen, 2019). Additionally, a Winsorization technique at the upper and lower 1% was applied to continuous variables to mitigate the effects of outliers (Wang et al., 2024; Shi, 2020). After these refinements, the final sample included 16,665 firm-year observations representing 3,609 unique businesses.

2.2. Variable measurement

Considering the current objectives of this study and the different methods used in previous studies, this investigation used specific variable selection to represent ESOP, operation efficiency, information transparency, and corporate debt default risk, and data analyses to test the hypotheses of the study.

2.2.1. Independent variables

In this study, two key variables related to employee stock ownership plans - ESOP and the ESOP Ratio. The variable ESOP is a binary indicator that identifies whether a company is implementing an ESOP in the current year, taking a value of 1 if the company has an active ESOP in that year and 0 otherwise. Additionally, the ESOP ratio is introduced as a continuous variable, representing the proportion of total shares allocated to the ESOP relative to the company's total outstanding shares.

Since ESOPs typically involve a lock-up period of one to three years as part of the company's long-term incentive strategy, the implementation period is defined from the date the ESOP proposal is approved at the shareholders' meeting to the announcement of the completion of the underlying stock sale. All years within this timeframe are considered part of the ESOP implementation period, following the approach outlined by Cheng et al. (2024), and Liu and Zhao (2022). The inclusion of both the ESOP variable and the ESOP Ratio allows for a more comprehensive analysis of the impact of ESOP adoption and its intensity on corporate outcomes.

2.2.2. Dependent variable

In this study, a simplified version of the Morton model was used to calculate the default risk (Merton, 1974 cited in He et al., 2023; Ding et al., 2021; and Li & Ding, 2020), and the calculation process is as follows:

$$DD_{it}=\frac{log\left(\frac{V_{A\,it}}{D_{it}}\right)+\left(\mu_{it}-\frac{\sigma_{A\,it}^{2}}{2}\right)\times T_{it}}{\sigma_{A\,it}\times\sqrt{T_{it}}}$$

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where, DD_{it} represents the Default distance, $V_{A\,it}$ as the Market value of enterprise assets, D_{it} represents the carrying value of debt, μ_{it} is the expected return on assets, $\sigma_{A\,it}$ is the Total enterprise value volatility, and T_{it} as the Call Option Expiration.

This model is simplified using:

$$DD_{it}=\frac{log\left(\frac{Equity_{it}+Debt_{it}}{Debt_{it}}\right)+\left(r_{it-1}-\frac{\sigma_{Vit}^{2}}{2}\right)\times T_{it}}{\sigma_{Vit}\times\sqrt{T_{it}}}$$

where, $Equity_{it}$ represents the total market capitalization of the firm, and $Debt_{it}$ as the nominal value of debt. To obtain the σ_{Vit} substitution, total value volatility was estimated using:

$$\sigma_{Vit}=\frac{Equity_{it}}{Equity_{it}+Debt_{it}}\times\sigma_{Eit}+\frac{Equity_{it}}{Equity_{it}+Debt_{it}}\times\left(0.05+0.25\times\sigma\right)_{Eit}$$

This indicates σ_{Eit} as the volatility of monthly stock returns in the previous year.

Finally, the standard cumulative normal distribution function was used to calculate the probability of corporate debt default (EDF), with a higher index indicating a higher risk of debt default.

$$EDF_{it}=Normal\left(-DD_{it}\right)$$

2.2.3. Mediating variables

This study investigates the governance role of ESOP implementation in reducing debt default risk, focusing on operational efficiency and information transparency as mediators. Operational efficiency (OpEff), represented by return on equity (ROE), reflects a firm's asset management effectiveness and overall performance (Cha et al., 2019). ROE, a comprehensive metric derived from DuPont analysis, captures profitability, asset turnover, and debt servicing capacity.

Additionally, information transparency is measured using the Information Disclosure Transparency Score (IDTS), which evaluates the timeliness, accuracy, completeness, and compliance of a firm's disclosures (Fang, 2024). By analyzing these mediators, the study aims to understand the internal and external mechanisms through which ESOPs mitigate corporate default risk.

a) Control variables

This study adopts control variables based on the framework proposed by Meng et al. (2019), incorporating firm characteristics and debt-related factors. These include firm size (Size), number of independent directors (Indep), ownership concentration of the largest shareholder (Balance), board size (NUM), management ownership (Mshare), and debt guarantee capacity (Tang). Given the substantial variation in firm size, this variable was logarithmically transformed to enhance comparability. Additionally, year effects were controlled for and excluded to minimize potential temporal biases.

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2.3. Analytical Procedures

To test the hypotheses of the study, the Fixed Effects Model (FEM) was employed due to its robustness in controlling for unobserved heterogeneity. For testing whether ESOP affects EDF (H1), the models below were used:

$$EDF_{it} = \beta_0 + \beta_1 ESOP_{it} + Control_{it}\gamma + \mu_t + \varepsilon_{it}$$

$$EDF_{it} = \alpha_0 + \alpha_1 ESOP\ Ratio_{it} + Control_{it}\gamma + \mu_t + \varepsilon_{it}$$

where, EDF_{it} represents Expected Default Frequency for firm i in year t; $ESOP_{it}$ is a dummy variable (1 = ESOP implemented, 0 = otherwise) for firm i in year t; $ESOP\ Ratio_{it}$ is the proportion of shares under ESOP for firm i in year t; β_1 and α_1 are the coefficients for ESOP and ESOP Ratio respectively;β_0 and α_0 are the firm-specific fixed effect (accounts for unobserved heterogeneity across firms); γ is the coefficients of control variables; μ_t is the year-fixed effects to control for time-specific shocks; and ε_{it}as the error term.

This study aims to gain a comprehensive understanding of the impact of ESOP on debt default risk. This can be done by incorporating mediating factors to explore its potential influence on financial stability such as operations efficiency (H2) and information transparency (H3). To test these can be specified using a two-step mediation framework:

Step 1a: Mediator Model (Operational Efficiency as the Dependent Variable)

$$OpEff_{it} = \beta_0 + \beta_2 X_{it} + Control_{it}\gamma + \mu_t + \varepsilon_{it}$$

Step 1b: Mediator Model (Information Transparency as the Dependent Variable)

$$IDTS_{it} = \alpha_0 + \alpha_2 X_{it} + Control_{it}\gamma + \mu_t + \varepsilon_{it}$$

where, $OpEff_{it}$ refers to the mediator Operational Efficiency for firm i year t and $IDTS_{it}$ is the information disclosure transparency score representing mediator information transparency for firm i year t; X_{it}can be either ESOP or ESOP ratio; β_2 and $\alpha_2$are coefficients representing the direct effects of either ESOP or ESOP ratio on operation efficiency and information transparency respectively.

Step 2: Outcome Model (EDF as the Dependent Variable)

$$EDF_{it} = \beta_0 + \beta_3 X_{it} + \beta_4 OpEff_{it} + Control_{it}\gamma + \mu_t + \varepsilon_{it}$$

$$EDF_{it} = \alpha_0 + \alpha_3 X_{it} + \alpha_4 IDTS_{it} + Control_{it}\gamma + \mu_t + \varepsilon_{it}$$

where, β_4 and α_4 represent the mediated effect of operation efficiency and information respectively.

Diagnostic tests, including multicollinearity, heteroskedasticity, autocorrelation, cross-dependence, and the Hausman test, were conducted to ensure the validity and reliability of the model, reinforcing the robustness and accuracy of the findings.

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3. Results

To lay the groundwork for the analysis, it is essential to first examine the descriptive statistics and diagnostic test results. These provide valuable insights into the characteristics of the data and ensure the validity of the subsequent findings.

Table 1 presents the descriptive statistics for the variables used in this study, based on 16,665 firm-year observations. The mean EDF is 0.09, indicating a relatively low average default risk among sample firms. However, the substantial standard deviation of 0.240 highlights significant variability, suggesting that some firms face much higher default risks than others. The mean value for ESOP is 0.04, indicating that only a small proportion of firms implemented an ESOP during the observation period. Similarly, the ESOP Ratio has a mean of 0.00 with a maximum of 0.0159, reflecting the modest scale of equity allocation to ESOPs.

Table 1: Descriptive Statistics

Variable	Obs	Mean	SD	Min	Median	Max
EDF	16,665	0.09	0.240	1.06e-80	1.47e-06	0.999999
ESOP	16,665	0.04	0.204	0	0	1
ESOPRatio	16,665	0.00	0.002	0	0	0.0159
OpEff	16,665	0.05	0.118	-0.15063	1.00e-05	0.58
IDTS	16,665	3.02	0.654	1	3	4
Tang	16,665	0.20	0.152	0.0009492	0.1692	0.673783
Size	16,665	22.12	1.237	19.81459	21.969	26.08641
Indep	16,665	3.10	0.501	2	3	5
NUM	16,665	8.34	1.545	5	9	13
Balance	16,665	0.33	0.142	0.0877	0.3056	0.7076
Mshare	16,665	0.16	0.201	0	0.029614	0.68077

The descriptive statistics for the mediating variables show a mean Operational Efficiency (OpEff) of 0.05, with a minimum value of -0.15063, indicating that some firms experienced operational inefficiencies. The mean Information Disclosure Transparency Score (IDTS) is 3.02, suggesting that most firms achieved at least a moderate level of information transparency, with scores ranging from 1 (low) to 4 (high).

Among the control variables, Tangibility (Tang) has a mean of 0.20, indicating that tangible assets make up roughly 20% of total firm assets, with notable variation across firms. Firm Size (Size) has a mean value of 22.12, measured in logarithmic terms, indicating the presence of both smaller and larger firms in the sample. The average number of independent directors (Indep) is 3.10, consistent with common governance practices. Board Size (NUM) has a mean of 8.34, ranging from 5 to 13 members, reflecting the diversity in board structures.

Ownership characteristics reveal that the largest shareholder's ownership (Balance) averages 33%, indicating moderate ownership concentration. Meanwhile, Management Shareholding (Mshare) has a mean of 0.16, with a wide range from 0 to 0.68077, highlighting significant variation in managerial ownership.

Overall, these descriptive statistics provide key insights into the dataset. The limited adoption of ESOPs and the variability in EDF, Operational Efficiency, and IDTS emphasize the need to explore whether ESOPs influence debt default risk through

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internal operational improvements and enhanced information transparency. The differences in firm size, ownership structure, and governance characteristics further highlight the importance of controlling for these factors in the regression analysis to ensure robust findings.

In Table 2, the Variance Inflation Factor (VIF) analysis assesses multicollinearity among the independent variables in the model examining the effect of ESOP on EDF. A VIF above 10 typically indicates severe multicollinearity, while values below 5 suggest an acceptable level of correlation. In this analysis, ESOP and ESOPRatio have the highest VIF values (3.71), indicating moderate correlation but not at a concerning level. Other variables, such as Indep (2.06) and NUM (2.03), also show moderate VIF values, whereas Size (1.25), Mshare (1.17), Tang (1.04), and Balance (1.04) exhibit low multicollinearity. The mean VIF of 2.00 confirms that multicollinearity is not a significant issue in the model, ensuring reliable coefficient estimates in the regression analysis.

Table 2: Multicollinearity Analysis Results

Variables	VIF	1/VIF
ESOP	3.71	0.2695
ESOPRatio	3.71	0.2699
Indep	2.06	0.4856
NUM	2.03	0.4924
Size	1.25	0.8005
Mshare	1.17	0.8583
Tang	1.04	0.9586
Balance	1.04	0.9649
Mean VIF	2.00	

The diagnostic tests in Table 3 confirm the robustness of the panel regression model examining the effect of ESOP on EDF. The Breusch-Pagan test (χ^2 = 1.23, p = .267) indicates no heteroscedasticity, ensuring consistent standard errors. The Wooldridge test (F = 1.83, p = .176) suggests no autocorrelation, preventing biased estimates. The Pesaran CD test (Z = 0.845, p = .398) shows no cross-sectional dependence, meaning firm-specific shocks do not systematically affect others. Lastly, the Hausman test (χ^2 = 17.79, p = .013) supports the use of the fixed effects model (FEM), confirming that firm-specific effects are correlated with the regressors. These results validate the model's suitability for analyzing the impact of ESOP on EDF.

Table 3: Diagnostic Tests for Heteroscedasticity, Autocorrelation, Cross-dependence, and Hausman Specification

Test	Test Statistics	p-value
Breusch-Pagan Test (chi^2)	1.23	.267
Wooldridge Test (F)	1.83	.176
Pesaran CD Test (Z)	0.845	.398
Hausman Test (chi^2)	17.79	.013

DV = EDF

3.1. Impact of Employee Stock Option on Debt Default Risk

Understanding the financial implications of ESOP is crucial, particularly in assessing their influence on a firm's debt default risk. Given that ESOPs align employee interests

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with long-term corporate performance, their impact on financial stability remains a critical area of investigation. This study empirically examines the relationship between ESOP and debt default risk through rigorous hypothesis testing. The result is shown in Table 4.

Table 4: FEM Regression Results for the Impact of ESOP and ESOP Ratio on EDF

Predictors	**Model 1**				**Model 2**			
	β	**S.E.**	***t***	***p***	**β**	**S.E.**	***t***	***p***
ESOP	-.041	.008	-5.09	.000	-	-	-	-
ESOPRatio	-	-	-	-	-2.522	.7853	-3.21	.001
Tang	.007	.008	0.59	.553	.008	.0125	0.67	.505
Size	.047	.008	30.11	.000	.046	.001	30.00	.000
Indep	-.001	.007	-0.21	.836	-.001	.005	-0.19	.847
NUM	-.005	.007	-3.24	.001	.005	.002	-3.21	.001
Balance	-.093	.007	-7.82	.000	-.093	.012	-7.82	.000
MShare	-.019	.007	-2.09	.037	-.020	.009	-2.22	.027
Constant	-.927	.006	-27.76	.000	-.924	.033	-27.68	.000
FEM	Yes				Yes			
R^2	0.211				0.210			
F	320.63				319.14			
p-value	.000				.000			

Table 4 presents the FEM regression results analyzing the impact of ESOP and ESOP Ratio on debt default risk (EDF). In Model 1, ESOP is negatively associated with EDF (β = -0.041, t = -5.09, p < .001), indicating that higher ESOP participation reduces debt default risk. Model 2 replaces ESOP with ESOP Ratio, which also exhibits a significant negative effect on EDF (β = -2.522, t = -3.21, p = .001), reinforcing the risk-reducing role of ESOP.

Firm size (Size) is positively associated with EDF in both models (Model 1: β = 0.047, t = 30.11, p < .001; Model 2: β = 0.046, t = 30.00, p < .001), suggesting that larger firms experience higher default risk. In contrast, numerical board independence (NUM) and ownership balance (Balance) exhibit significant negative relationships with EDF across both models (NUM: β = -0.005, t = -3.24, p = .001; Balance: β = -0.093, t = -7.82, p < .001), indicating that higher governance quality mitigates default risk. Market share (MShare) is also negatively associated with EDF (Model 1: β = -0.019, t = -2.09, p = .037; Model 2: β = -0.020, t = -2.22, p = .027), suggesting firms with greater market control face lower default risks.

Both models explain approximately 21% of the variation in EDF ($R^2 \approx 0.21$), with highly significant overall model fit (F-statistics > 319, p < .001). These results highlight the potential of ESOPs in reducing debt default risk while emphasizing the influence of governance and firm characteristics.

3.2. Mediating Effect of Operational Efficiency on the Impact of Employee Stock Option on Debt Default Risk

The negative impact of ESOP on debt default risk, as established in the baseline model, suggests that employee ownership structures may contribute to financial stability. However, the extent to which this relationship operates through Operational Efficiency remains an open question. Given that efficient resource utilization and productivity improvements can reduce financial distress, this section investigates whether

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operational efficiency serves as a mediating channel in the ESOP-EDF relationship, further clarifying the mechanisms underlying this effect.

Table 5 presents the mediating role of Operational Efficiency (OpEff) in the relationship between ESOP, ESOP Ratio, and debt default risk using FEM. In both models, Operational Efficiency demonstrates a significant negative association with EDF (Model 1: β = -0.053, t = -3.51, p < .001; Model 2: β = -0.064, t = -4.44, p < .001), suggesting that improvements in operational efficiency reduce debt default risk.

Table 5: FEM Regression Results for the Mediating Effect of Operational Efficiency on the Impact of ESOP and ESOP Ratio on EDF

Predictors	Model 1				Model 2			
	β	S.E.	*t*	*p*	β	S.E.	*t*	*p*
ESOP	-.031	.009	-3.60	.000	-	-	-	-
ESOPRatio	-	-	-	-	-1.760	.803	-2.19	.028
OpEff	-.053	.015	-3.51	.000	-.064	.014	-4.44	.000
Tang	.008	.0125	0.62	.537	.008	.012	0.67	.500
Size	.046	.001	29.91	.000	.046	.001	29.81	.000
Indep	-.001	.005	-0.20	.840	-.001	.005	-0.19	.848
NUM	-.004	.001	-3.21	.001	-.005	.001	-3.18	.001
Balance	-.089	.012	-7.44	.000	-.088	.012	-7.36	.000
MShare	-.016	.009	-1.82	.068	-.016	.009	-1.85	.064
Constant	-.921	.033	-27.59	.000	-.918	.033	-27.50	.000
FEM	Yes				Yes			
R^2	0.211				0.211			
F	298.82				298.08			
p-value	.000				.000			

After including OpEff, the negative impact of ESOP on EDF remains significant but is slightly reduced (β = -0.031, t = -3.60, p < .001), while the ESOP Ratio also maintains a significant negative effect (β = -1.760, t = -2.19, p = .028). This partial reduction in effect suggests that OpEff mediates the relationship, indicating that ESOP participation and ownership structure contribute to lower default risk partially through enhanced operational efficiency.

Firm size (Size) continues to exhibit a strong positive association with EDF in both models (β = 0.046, t ≈ 29.9, p < .001), implying that larger firms may face higher debt risks. Meanwhile, governance-related variables such as board numerical independence (NUM) and ownership balance (Balance) remain negatively associated with EDF, reinforcing their role in mitigating financial distress risks (NUM: β ≈ -0.004, t ≈ -3.2, p = .001; Balance: β ≈ -0.089, t ≈ -7.4, p < .001). Market share (MShare) shows a marginal negative effect but does not reach full statistical significance (p ≈ .064–.068).

The models explain 21.1% of the variation in EDF (R^2 = 0.211), with a highly significant overall fit (F ≈ 298, p < .001). These findings highlight the role of ESOPs in reducing default risk, with operational efficiency acting as a crucial channel through which employee ownership structures enhance financial stability.

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3.3. Mediating Effect of Information Transparency on the Impact of Employee Stock Option on Debt Default Risk

Building on the findings regarding Operational Efficiency as a mediator, which demonstrated its role in reducing debt default risk in firms with ESOPs, this section explores whether Information Transparency similarly functions as a mediating mechanism. Given that transparency enhances investor trust and mitigates risk perception, it is crucial to examine whether ESOP adoption fosters improved disclosure practices, thereby further reducing default risk. This analysis extends the understanding of ESOPs' influence on financial stability by investigating the extent to which enhanced information disclosure complements operational efficiency in mitigating EDF.

Table 6 presents the Fixed Effects Model (FEM) regression results assessing the mediating role of Information Transparency (IDTS) in the relationship between Employee Stock Ownership Plans (ESOP), ESOP Ratio, and Debt Default Risk (EDF). The results indicate that IDTS has a significant negative association with EDF in both models ($\beta = -0.057$, $t \approx -21.9$, $p < .001$), suggesting that greater transparency reduces default risk.

Table 6: FEM Regression Results for the Mediating Effect of Information Transparency on the Impact of ESOP and ESOP Ratio on EDF

Predictors	**Model 1**				**Model 2**			
	β	**S.E.**	***t***	***p***	**β**	**S.E.**	***t***	***p***
ESOP	-.034	.008	-4.34	.000				
ESOPRatio					-2.013	.774	-2.60	.009
IDTS	-.057	.003	-21.89	.000	-.057	.003	-21.98	.000
Tang	.003	.012	0.23	.814	.004	.012	0.30	.765
Size	.054	.002	34.58	.000	.054	.001	34.50	.000
Indep	.001	.005	0.16	.874	.001	.005	0.17	.862
NUM	-.004	.001	-2.45	.014	-.004	.001	-2.42	.015
Balance	-.054	.012	-4.56	.000	-.054	.012	-4.55	.000
MShare	.005	.009	0.60	.550	.004	.009	0.49	.621
Constant	-.947	.033	-28.76	.000	-.944	.033	-28.68	.000
FEM	Yes				Yes			
R^2	0.235				0.234			
F	340.53				339.42			
p-value	.000				.000			

After incorporating IDTS, the negative impact of ESOP on EDF remains significant but slightly weaker ($\beta = -0.034$, $t = -4.34$, $p < .001$), while the ESOP Ratio also retains its negative effect ($\beta = -2.013$, $t = -2.60$, $p = .009$). This reduction in effect suggests that information transparency partially mediates the relationship, implying that ESOP mechanisms lower default risk in part by improving transparency.

Among the control variables, firm size (Size) continues to show a strong positive association with EDF ($\beta = 0.054$, $t \approx 34.5$, $p < .001$), indicating that larger firms may face higher default risk. Meanwhile, numerical board independence (NUM) and ownership balance (Balance) maintain negative associations with EDF, reinforcing their role in mitigating financial distress risks (NUM: $\beta \approx -0.004$, $t \approx -2.4$, $p \approx .014$–$.015$; Balance: $\beta \approx -0.054$, $t \approx -4.5$, $p < .001$). However, market share (MShare) and tangibility (Tang) do not exhibit statistically significant effects on EDF ($p > .05$).

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The models explain approximately 23.4%–23.5% of the variation in EDF ($R^2 \approx 0.235$), with a highly significant overall fit ($F \approx 340$, $p < .001$). These findings emphasize the role of ESOPs in reducing default risk, with information transparency serving as a critical mechanism that enhances financial stability.

4. Discussion

The findings from this study provide empirical insights into the impact of ESOPs on debt default risk and the mediating roles of operational efficiency and information transparency. The results align with and extend existing literature by elucidating the mechanisms through which ESOP influences financial stability.

Table 4 presents the results of the FEM regression analyzing the direct impact of ESOP on debt default risk. The results indicate that ESOP adoption significantly reduces debt default risk ($p < .01$), supporting the H1 that ESOP mitigates firms' default risk. Similarly, the ESOP ratio also exhibits a significant negative relationship with debt default risk ($p < .01$). These findings align with Cheng et al. (2024), who suggested that ESOP contributes to reduced corporate debt levels, ultimately lowering financial distress. This also supports Campa and Kern (2020), who found that ESOPs are associated with a lower cost of debt, as they enhance financial stability and reduce the perceived risk among lenders.

However, the extent to which ESOP influences debt default risk remains conditional upon firm-specific and macroeconomic factors. For example, Wang (2024) suggested that excessive ESOP allocation relative to total share capital could increase financial burdens, potentially elevating default risk under certain conditions. This highlights the need for firms to carefully calibrate their ESOP policies to avoid unintended financial constraints.

Table 5 examines whether operational efficiency mediates the relationship between ESOP and debt default risk (H2). The results demonstrate that operational efficiency significantly reduces debt default risk ($p < .01$), suggesting that higher efficiency contributes to financial stability. Furthermore, when operational efficiency is included as a mediator, the magnitude of the direct effect of ESOP on debt default risk decreases, indicating partial mediation. This finding is consistent with Sajid et al. (2023) and Wang, G. et al. (2023), who argued that ESOPs improve operational efficiency by aligning employee incentives with corporate goals, leading to better financial performance and risk mitigation.

These results also support the argument that operational efficiency enhances firms' resource allocation, reduces costs, and minimizes agency problems (Ren et al., 2019; Handoyo et al., 2023). However, some studies present conflicting perspectives, such as Kanoujiya and Rastogi (2024), who found that efficiency improvements in Indian banks had no significant impact on default risk. This discrepancy suggests that while operational efficiency is generally beneficial, its effectiveness in reducing default risk may be context-dependent, influenced by industry and governance structures.

Table 6 explores the mediating effect of information transparency in the ESOP-debt default risk relationship. The findings reveal that information transparency significantly reduces debt default risk ($p < .01$). The inclusion of this mediator weakens the direct

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impact of ESOP on debt default risk, suggesting partial mediation. These results are consistent with prior research indicating that transparency enhances investor confidence, reduces information asymmetry, and improves financial stability (Wang, G. et al., 2023; Fang, 2024). Moreover, Zheng (2024) demonstrated that digital disclosure in China's A-share market effectively lowers default risk by improving investor sentiment and firm credibility.

However, the findings also align with Brancati and Macchiavelli (2015), who cautioned that while transparency generally reduces risk, it may also heighten firms' exposure to market sentiment shifts, potentially increasing financial vulnerability. Thus, firms must balance disclosure practices to ensure that transparency benefits outweigh any unintended market reactions.

The findings of this study contribute to a deeper understanding of how ESOP influences debt default risk, particularly through the mediating roles of operational efficiency and information transparency. By highlighting these mechanisms, the study extends previous research on corporate governance and financial risk management.

5. Conclusion

Employee Stock Ownership Plans have gained significant attention in corporate governance and financial risk management, particularly in their role in shaping firm stability. This study investigates the impact of ESOPs on debt default risk in Chinese-listed firms, considering the mediating effects of operational efficiency and information transparency. The study analyzes data from companies listed on China's Shanghai and Shenzhen A-share markets between 2014 and 2020, sourced from the China Stock Market and Accounting Research (CSMAR) database. After applying necessary exclusions and data refinements, the final sample consists of 16,665 firm-year observations. ESOP implementation is measured using a binary indicator and an ESOP ratio. Debt default risk is assessed using a simplified version of the Merton (1974) model, while operational efficiency and information transparency serve as mediators. The study employs a FEM to control for unobserved heterogeneity and a two-step mediation framework to analyze indirect effects. Diagnostic tests are conducted to ensure the robustness of results.

The empirical results provide strong evidence that ESOP implementation contributes to reducing corporate financial distress by enhancing governance mechanisms and managerial incentives. The findings indicate that ESOP implementation is significantly associated with a reduction in corporate default risk. Firms that adopt ESOPs experience a lower likelihood of default, suggesting that employee ownership enhances financial stability and aligns managerial interests with long-term firm value. The results further demonstrate that ESOP adoption positively influences operational efficiency, as reflected in higher return on equity (ROE). This suggests that ESOPs enhance corporate performance by motivating employees, improving resource utilization, and fostering a more engaged workforce. Additionally, the study confirms that ESOPs improve information transparency, as evidenced by higher Information Disclosure Transparency Scores (IDTS). Enhanced transparency reduces information asymmetry, bolsters investor confidence, and contributes to stronger financial governance, further mitigating debt default risk.

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5.1. Implications

From a theoretical perspective, this study extends corporate finance and governance literature by demonstrating how ESOPs function as a risk-reducing mechanism. Prior research has primarily examined ESOPs as incentive structures, whereas this study highlights their broader impact on financial transparency and operational efficiency, reinforcing their role in mitigating default risk. The findings align with agency theory, showing that ESOPs help reduce conflicts of interest between shareholders and management by aligning managerial incentives with long-term firm stability. Additionally, this study provides empirical support for the governance-enhancing role of ESOPs in reducing financial distress through improved operational efficiency and disclosure practices.

Practically, these findings offer valuable insights for corporate leaders, policymakers, and investors. Firms can leverage ESOPs as a strategic tool to enhance financial stability, operational efficiency, and market credibility. To maximize these benefits, firms should integrate ESOPs into broader corporate governance frameworks, ensuring alignment with risk management policies. Policymakers could also encourage ESOP adoption through regulatory incentives, tax benefits, or targeted financial support, particularly for firms in industries with higher financial risk exposure. Strengthening disclosure requirements and transparency standards for ESOP-implementing firms may further enhance investor confidence and reduce default risk.

5.2. Limitations and Future Research Agenda

While the study provides robust evidence, several limitations should be acknowledged. First, the dataset focuses on Chinese-listed firms, limiting the generalizability of the findings to other economic contexts. Future research could extend this analysis to different financial markets with varying regulatory environments. Second, while the study employs a mediation framework, exploring additional moderating factors—such as macroeconomic conditions or industry-specific variables—could offer deeper insights into the ESOP-EDF relationship. Finally, future research could examine the long-term impact of ESOPs beyond the study period to determine whether the observed benefits persist over time.

Overall, this study enhances the understanding of ESOPs as a governance tool that influences financial risk, offering meaningful implications for academics, practitioners, and policymakers alike.

Ethics Approval and Consent to Participate

This study utilized properly obtained secondary data and strictly adhered to all ethical standards concerning research involving human subjects. Informed consent was obtained from all participants, who were assured of their anonymity and the confidentiality of their responses. They were also informed that the study posed minimal risk and that participation was entirely voluntary, with the option to withdraw at any time without any negative consequences.

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Conflict of Interest

The authors reported no conflicts of interest for this work and declare that there is no potential conflict of interest with respect to the research, authorship, or publication of this article.

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