The Impact of Cross-Shareholding Reform in State-Owned Enterprises on Capital Efficiency: An Empirical Analysis Based on China's Mixed-Ownership Reform Data

Sihao Sun

Faculty of Management and Economics, Kunming University of Science and Technology, Kunming, China
202311017324@stu.kust.edu.cn

Abstract. State owned enterprises (SOEs) occupy a pivotal core position in China's economic system, and their operational efficiency has a profound and critical impact on the overall economic performance. In recent years, in order to enhance the efficiency and competitiveness of state-owned enterprises, the government has vigorously promoted mixed ownership reform through cross shareholding. However, the specific impact of these reform measures on capital efficiency has not yet been comprehensively and thoroughly studied. Especially when considering the dynamic characteristics of capital allocation and the inevitable endogeneity issues in empirical analysis, there are obvious shortcomings in related research. This study innovatively adopts the dynamic generalized moment estimation (GMM) model and conducts empirical analysis using longitudinal data of Chinese A-share listed companies from 2015 to 2023. The research results show that a higher proportion of cross shareholding is significantly correlated with the improvement of capital efficiency, which fully indicates that cross shareholding may be an effective and feasible way to improve the capital utilization efficiency of state-owned enterprises.

Keywords: State-Owned Enterprises, Cross-Shareholding, Capital Efficiency, Mixed-Ownership Reform, System GMM.

1 Introduction

Cross-shareholding is a corporate equity structure where two or more companies invest in and hold shares of each other to achieve strategic cooperation and consolidate their industry positions. This creates a complex interlocking equity structure where companies are intertwined. In this way, different companies can establish strategic cooperative relationships [1]. Cross-shareholding emerged as a unique equity structure in Japan in the 1950s, initially to enhance investment returns and deter hostile takeovers [2]. It subsequently became popular among various Japanese companies and later spread to Western countries, where it gained increasing acceptance. With the global spread of

M. M. Husin (ed.), *Proceedings of the 2025 International Conference on Financial Innovation and Marketing Management (FIMM 2025)*, Advances in Economics, Business and Management Research 353,
https://doi.org/10.2991/978-94-6463-874-5_25

cross-shareholding, it has become an important form of the mixed-ownership reform of state-owned enterprises in China, drawing attention to its impact on capital efficiency.

The "Three-Year Action Plan for State-Owned Enterprise Reform" in 2020 called for the active promotion of mixed-ownership reform to facilitate the complementary development of enterprises with different ownership structures. In 2022, the State-owned Assets Supervision and Administration Commission (SASAC) has urged state-owned firms to enhance equity collaboration both among themselves and with private sector entities to realize synergistic benefits, coordinated development, and enhanced value and competitiveness. On the other hand, as China's market-oriented reform deepens and its capital market grows rapidly, companies face increasing external business risks and uncertainties. This indicates that the traditional model of independent operation is no longer suitable for the rapidly changing market demands. Meanwhile, with the further advancement of economic globalization, the circulation of resources and products on a global scale has become more frequent, offering companies the opportunity to integrate global resources while also posing greater challenges to their resource integration capabilities. Under these market drivers, cross-shareholding has gradually become a strategic choice for many companies. Therefore, within the framework of policy support and market incentives, cross-shareholding has gained prevalence among Chinese listed companies. To address this, this study utilizes a System GMM model with longitudinal data from Chinese A-share listed corporations from 2015 to 2023, addressing the endogeneity and dynamic adjustment issues that traditional static models cannot effectively capture. It empirically investigates the influence of cross-shareholding reform in state-owned enterprises on capital efficiency, with the goal of generating novel research outcomes and offering theoretical and practical perspectives on the effectiveness of the reform.

2 Literature Review

Cross-shareholding, as an important innovative form of mixed-ownership reform in state-owned enterprises, has sparked extensive discussions on its mechanism for optimizing capital efficiency at both theoretical and practical levels. Originating in Japan, cross-shareholding quickly gained popularity in some developed European countries. As a result, research on cross-shareholding abroad started earlier and has a more comprehensive theoretical foundation. Early research primarily focused on the defensive functions of cross-shareholding, such as Japanese firms using interlocking shareholdings to deter hostile takeovers or refusing to sell their shares when faced with such attempts [2,3]. Norwegian Swedish power companies have also used cross-shareholding to increase profits [4]. As the bond market evolves, cross-shareholding has grown more prevalent among Chinese companies[5].

Existing research mainly focuses on how cross-shareholding helps reduce transaction risks, improve investment efficiency, and resist hostile takeovers [6-8]. Cross-shareholding among Chinese firms has strong synergistic effects, promoting technological innovation [9]. Moderate cross-shareholding can also curb insider control through equity checks and balances, and cross-shareholding along vertical industry chains can

accelerate capital turnover [10,11]. Many scholars have also found that while cross-shareholding can increase profits and transaction risks, it can also have certain impacts on market competition [12]. In terms of its impact on corporate performance, some scholars argue that cross-shareholding can enhance firm performance [13]. However, other scholars have found that while cross-shareholding in Chinese listed companies may improve their performance, such improvements may not be sustainable [14]. Existing literature, mostly based on static panel models, fails to effectively capture the dynamic adjustment characteristics of capital efficiency. There are methodological shortcomings in addressing endogeneity issues, and existing studies inadequately identify bidirectional causality. This paper fills the gap by employing a dynamic GMM model, which considers the dynamic adjustment of capital efficiency to ensure robust results. While this study makes breakthroughs in theoretical methods and empirical design, it still has limitations. Although the dynamic GMM model mitigates endogeneity, the interactive effects of industry policy shocks (such as supply-side reforms) and firm heterogeneity (such as monopolistic industries) need to be further explored through stratified tests.

In summary, cross-shareholding can enhance corporate performance and increase profits. Based on this, the study hypothesis H is proposed: The proportion of cross-shareholding has a positive promoting effect on the improvement of capital efficiency.

3 Research Design

3.1 Research Methodology and Variables and Data

This paper measured capital efficiency using the return on invested capital (ROIC) [15]. To assess the impact of cross-shareholding on capital efficiency, incorporate a one-period lag of ROIC to capture its dynamic characteristics, given that capital efficiency exhibits lagged effects.

$$\mathrm{ROIC}_{i,t} = \alpha_0 + \alpha_1 \mathrm{ROIC}_{i,t-1} + \alpha_2 \mathrm{CSH} + \alpha_3 \mathrm{control}_{\mathrm{i,t}} + \varepsilon_{i,t} \qquad (1)$$

Where: ROICi,t is the return on invested capital (the dependent variable) for firm i at time t, ROICi,t-1is the one-period lagged return on invested capital,CSH is the cross-shareholding ratio (the key explanatory variable), The control variables are represented by controli.t, εi,t signifies the stochastic error component, and i and t correspond to the specific firm and the time period, respectively. Table 1 shows the variable definitions and measurement.

Table 1. Variable definitions and measurement

Variable Type	Variable Name	Abbreviation	Definition/Measurement
Explanatory	Cross-Shareholding Ratio	CSH	Total shares held by all listed companies ÷ Total shares of the held listed companies

Dependent	Return on Invested Capital	ROIC	Net Profit ÷ (Shareholders' Equity + Interest-Bearing Liabilities)
Control	Firm Size	Size	Natural logarithm of total assets (ln(Total Assets))
Control	Financial Leverage	Leverage	Total Liabilities ÷ Total Assets
Control	Growth Opportunity	Growth	(Current Operating Revenue – Prior Operating Revenue) ÷ Prior Operating Revenue
Control	Ownership Concentration	Top1	Shareholding percentage of the largest shareholder (%)

3.2 Data Description

To ensure data availability and integrity, the study focuses on state-owned A-share listed companies in China from 2015 to 2023. This paper exclude financial institutions and samples labeled as ST or ST*. This paper also remove cases with missing data and apply a 1% fissurization to continuous variables. Basic company information, executive details, and financial data are sourced from the CSMAR database. Descriptive statistics for the variables are presented in Table 2.

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev	Min	Max
ROIC	2499	0.059	0.076	-0.260	0.276
CSH	2499	0.105	0.154	0.000	0.723
Size	2499	23.761	1.604	20.530	28.052
Leverage	2499	0.479	0.197	0.079	0.899
Growth	2499	0.113	0.316	-0.620	1.758
Top1	2499	36.601	16.200	9.030	76.310

4 Analysis of Regression Results

4.1 Analysis of Dynamic Model Regression Results

To bolster the robustness of the findings and tackle potential endogeneity concerns, this research utilizes the System GMM estimation method. The results of the AR serial correlation tests indicate that there is no second-order or higher-order autocorrelation in the disturbances, which meets the prerequisite assumptions for GMM regression. Additionally, the Hansen over-identification test results accept the null hypothesis that "all instrumental variables are valid," indicating that the model specification has passed the

validity test. The regression results show that the coefficient of the one-period lagged dependent variable (L.ROIC) is positive at the 1% significance level, indicating a certain degree of "time persistence" in the dependent variable, which is effectively addressed by the GMM approach. In the context of mixed-ownership reform in state-owned enterprises, the significance of the one-period lagged ROIC not only reveals the dynamic adjustment mechanism of capital efficiency but also highlights the need to consider the time dimension in policy effectiveness evaluation. The cross-shareholding ratio (CSH) is significantly positive, indicating that a higher cross-shareholding ratio has a positive effect on improving capital efficiency, thus validating the hypothesis H presented earlier.

Table 3. The impact of cross-shareholding reform in state-owned enterprises on capital efficiency

VARIABLES	ROIC
L.ROIC	0.4693***
	(14.04)
CSH	0.0151**
	(2.33)
Size	0.5062***
	(3.96)
Growth	5.5205***
	(10.84)
Top1	0.0155*
	(1.74)
Leverage	-7.2252***
	(-6.47)
Constant	-6.9030***
	(-2.68)
AR1	0.000
AR2	0.365
Hansen	0.185

As shown in Table 3, within the set of control variables, the regression coefficient associated with Firm Size is positive and achieves statistical significance at the 1% level, suggesting that an increase in firm size substantially enhances capital efficiency. Large state-owned enterprises can reduce the management costs of capital per unit through economies of scale, while their diversified business structures help to diversify investment risks. During the reform process, priority should be given to promoting cross-shareholding among large state-owned enterprises to amplify synergistic effects. The coefficient for Leverage is significantly negative, indicating that a high debt-to-asset ratio significantly suppresses capital efficiency, likely to reflect the financial pressure brought about by high levels of debt. For example, high leverage may increase interest expenses and limit the funds available for investment in high-return projects, thereby reducing capital efficiency. The coefficient for Growth is significantly positive,

indicating that high-growth firms experience the most significant improvement in capital efficiency. From a dynamic perspective, growth-oriented firms can quickly obtain complementary resources through cross-shareholding, as seen in the technology-channel synergy case between JD Logistics and COSCO Shipping.Top 1 is positively correlated with capital efficiency, especially in state-owned enterprises, where the largest shareholder is typically the state. This suggests that higher state control is associated with better supervisory mechanisms. For instance, high concentration may reduce short-term managerial behavior and encourage firms to focus more on long-term capital efficiency.

4.2 Robustness Checks

To mitigate potential biases arising from the selection of proxy variables, this study adopts an alternative variable strategy for robustness testing, with the results detailed in Table 4.

Table 4. Results of the robustness checks

VARIABLES	ROA
L.ROA	0.4719***
	(7.44)
CSH	0.0153**
	(2.41)
Size	0.3684***
	(3.46)
Growth	3.2165***
	(9.32)
Top1	0.0078
	(1.30)
Leverage	-6.8365***
	(-5.92)
Constant	-3.0435
	(-1.63)
AR1	0.000
AR2	0.181
Hansen	0.244

5 Conclusion

This research investigates the influence of cross-shareholding reform in state-owned enterprises on capital efficiency, leveraging data from Chinese A-share listed firms between 2015 and 2023. After addressing endogeneity issues using the System GMM model, observe a notable positive association between the cross-shareholding ratio and enhanced capital efficiency. The System GMM model effectively resolves the biases associated with traditional static analysis, offering a methodological innovation for research on state-owned enterprise reform in emerging economies.

The findings of this study hold implications for both firms and policymakers. First, in the context of mixed-ownership reform in state-owned enterprises, policy effectiveness evaluations must account for the temporal dimension. Second, a differentiated reform mechanism should be established for highly leveraged firms, optimizing capital structures through financial instruments such as debt-to-equity swaps. Third, state-owned firms may consider incrementally expanding cross-shareholding to boost capital efficiency. However, given the potential benefits of cross-shareholding for capital efficiency, the government must remain vigilant to prevent its abuse, which could result in industry monopolies and market instability. Therefore, the government should strengthen regulations to prevent malicious cross-shareholding practices.

References

1. Shen, Y.: Analysis of motives and effects of corporate cross-shareholding. Jiangxi University of Finance and Economics, (2024)
2. Nyberg, S.: Reciprocal shareholding and takeover deterrence. International Journal of Industrial Organization **13**(3), 355-372 (1995)
3. Osano, H.: Intercorporate shareholdings and corporate control in the Japanese firm. Journal of Banking and Finance **20**(6), 1047-1068 (1996)
4. Amundsen, E.S., Bergman, L.: Will cross-ownership re-establish market power in the Nordic power market? The Energy Journal **23**(2), 73-95 (2021)
5. Peng, Z., et al.: Cross-shareholding and financing constraints of private firms: based on the perspective of social network. Physica A: Statistical Mechanics and its Applications **520**, 381-389 (2019)
6. Williamson, O.E.: Transaction-cost economics: the governance of contractual relations. Journal of Law and Economics **22**(2), 233-261 (1979)
7. He, L.: Cross-shareholding scale and investment efficiency of listed companies: tests based on market risk and industry competition. Finance and Accounting Monthly **14**, 53-61 (2022)
8. Zhu, J., Li, X., Wang, C.: Research on related issues of enterprise value evaluation under cross-shareholding. China Assets Evaluation **8**, 30-38+49 (2022)
9. Bai, Z.: Impact of cross-shareholding network on corporate innovation. Shanxi University, (2023)
10. Huang, C., Zhang, J.: Cross-shareholding, insider control and operating performance: empirical research based on Shanghai and Shenzhen listed companies. Commercial Research **12**, 102-109 (2016)
11. Ji, Y.: Motives and economic consequences of vertical cross-shareholding in state-owned enterprises. Soochow University, (2022)
12. Ma, H., Zeng, C., Li, Z.: Cross-shareholding, corporate competition and two-way entry deterrence. Management Review **34**(12), 73-85 (2022)
13. Brooks, C., Chen, Z., Zeng, Y.: Institutional cross-ownership and corporate strategy: the case of mergers and acquisitions. Journal of Corporate Finance **48**, 187-216 (2018)
14. Ran, M.: Effects of cross-shareholding in Chinese listed companies: financial characteristics and performance. Journal of Zhongnan University of Economics and Law **6**, 93-100+144 (2021)
15. Zhang, J.: Impact of ESG disclosure level on financial performance of manufacturing enterprises. Hebei University of Economics and Business, (2024)