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Do controlling shareholders' equity pledges affect M&A investment? Evidence from listed companies in China

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ABSTRACT

As a new financing method, equity pledges are popular in China's capital market. With the emergence of new financing models, will the relationship between financing and investment in corporate financial management change? The purpose of this study is to determine whether the controlling shareholders' equity pledges affect corporate merger and acquisition (M&A) investment decisions. This paper uses data for listed companies from the China Stock Market & Accounting Research (CSMAR) database, and Stata 17 is used as the data processing software. The M&A variable is virtual and uses the logit model to study the relationship between controlling shareholders' equity pledges and M&A investments. To test the robustness of the results, we replace the key variables, transform the model, and use the Gaussian Mixture Model (GMM) method to obtain the same results. The study found a positive correlation between controlling shareholders' equity pledges and M&A investments. Further cross-sectional study shows that the positive correlation is stronger in state-owned companies, non-manufacturing companies, and companies with low pledge ratios. This study is conducive to standardizing the equity pledge behavior of listed companies and safeguarding the interests of investors.

Contribution/Originality: This study expands the existing literature on the determinants of corporate merger and acquisition investment decisions by considering the impact of equity pledges on M&A investment from the perspective of controlling shareholders.

1. INTRODUCTION

In the active field of China's capital market, the financing method of equity pledges has become a beacon of innovation. As of April 28, 2023, 2,474 companies accounted for 59.47% of all A-share listed companies participating in the equity pledge phenomenon. The financial revolution won a total of 17,200 pledges, including a shocking 387.522 billion shares with an incredible value of 3.22 trillion yuan. What is the secret behind the rapid rise of equity pledges? First of all, unlike traditional businesses offering services such as bank loans, equity pledges provide attractive advantages, including convenient procedures, freedom to use funds flexibly, and cheap financing costs. The most important aspect is that equity pledges have the attractive advantage of delaying tax payments, which provides financial breathing space for controlling shareholders. When shareholders can enjoy the tax benefits of equity pledges, why would they be satisfied with the direct sale of equity? Through the pledge of stock rights,

shareholders have found the ultimate way to balance between maintaining control over their company and dispersing their wealth. Meanwhile, in China's market, investment is a key factor in stimulating economic development. In 2020, investment contributed more than 80% to economic growth. According to the statistics of the Wind Chinese M&A database, the transaction amount of China's M&A activities increased by 96.94% in 2020 to $8,541.454 million. Merger and acquisition investment shortens the investment cycle of a project and can quickly enter the target market. Mergers and acquisitions create economies of scale and reduce total costs.

Financing is a source of funding for a company, and investment is a channel for a company to obtain long-term development and enhance its value. Both of these are important links in a company's financial management and are related to the company's sustainable development. Will the emergence of equity pledges have an impact on companies' investment decisions? There are some gaps in the existing research. The impact of equity pledges on corporate investment focuses on innovation investment and investment efficiency. There is a lack of research on the relationship between M&A investment and equity pledges. In addition, research on the determinants of M&A investment is rarely carried out from the perspective of corporate financing, especially the emerging financing method of equity pledges. Therefore, the objective of this research is to test the influence of controlling shareholders' equity pledges on investment decisions regarding mergers and acquisitions.

First, the M&A variable is measured by whether corporations participate in M&A investment. The variable of M&A is virtual; therefore, the logit model is used to test the relationship between the controlling shareholders' equity pledges and M&A investments. Next, cross-sectional studies were performed to determine the impact of different property rights, industry characteristics, and pledge ratios on the relationship between controlling shareholders' equity pledges and corporate M&A investments. Finally, to test the robustness of the research, we replace the variables, transform the model, and use the Gaussian Mixture Model (GMM) model to test the relationship between the controlling shareholders' equity pledges and M&A investments.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1. Equity Pledges and Corporate Investment

The literature on the relationship between equity pledges and corporate investment revolves around supporting stock prices. After the equity pledge, if the stock price drops significantly, or even crashes, the pledgor needs to pledge more shares to stay above the warning line, or redeem the shares in advance, which is the margin call risk. In order to maintain control and avoid the risk of margin calls, the controlling shareholders usually take a series of measures in the investment strategy to prevent the stock price from falling.

Scholars unanimously affirm that the controlling shareholders have the leading role in the corporate decision-making process, and their equity pledging affects the corporate investment policy (Singh, 2018). However, the specific impact of equity pledges on corporate investment decisions is not uniform. Some scholars believe that equity pledges hurt corporate investment. Fabisik (2019) believes that corporate investment tends to be conservative after equity pledges. Pang and Wang (2020) share a similar view by finding that the controlling shareholders tend to make more conservative corporate decisions after an equity pledge, thus significantly reducing the risk of margin calls to secure their controlling position. The controlling shareholders' equity pledge reduces high-risk investments, such as research and development (R&D) and capital investments. This conservative investment policy will result in companies avoiding positive net present value projects with high risk (Chauhan, 2017). Innovation activities have a high failure rate and are prone to generating more bad news and accelerating stock price crashes, and controlling shareholders are more conservative when investing in innovation projects (Chen, 2019; Ren, Mo, Liu, Zheng, & Shen, 2022), which reduces the future innovation capability of the company (Pang & Wang, 2020; Zhou, Li, Yan, & Lyu, 2021) and hinders its long-term value (Xiao, Chen, Fang, & Zhang, 2021). Some scholars believe that equity pledges have a positive effect on corporate investment. Singh (2018) believes that equity pledges alleviate a company's financing constraints and provides funds for the expansion of

production capacity, which is beneficial to subsequent large-scale investments and increases the company's value. Hwang, Qiao, and Ku (2016) similarly concluded that equity mortgages increase the power to invest in new projects. Moreover, when more money is borrowed and used to invest in new securities or projects, the company's capital is highly liquid, stimulating the company's economic growth. Meanwhile, some scholars believe that investment decisions are not only related to whether the company has equity pledging, but are also affected by the proportion of the equity pledge. Mu, Zhou, and Cao (2020) found that a company's investment decisions are highly correlated with the equity pledge ratio. Companies with low equity pledge ratios invest in operating activities to improve performance, and companies with high equity pledge ratios may adopt short-term investment strategies, such as financial investment, in order to prevent the transfer of control, with high returns and quick results. Ke, Li, and Wu (2019) studied the types of corporate equity pledge affecting corporate investment behavior and found that the proportion of the equity pledge does not have a simple linear relationship with company investment, which shows that the controlling shareholders with different proportions of equity pledge adjust the company's investment strategy for different reasons. In order to prevent the transfer of shareholders' control, two types of inefficient investment—over-investment and under-investment—may result when the controlling shareholders make and implement investment decisions in the company (Mu et al., 2020). Moreover, risk tolerance affects investment efficiency, and the reduction of risk tolerance and equity pledging will inhibit risk investment. On the other hand, the equity pledge may result in insufficient investment in risky projects (Meng, Ni, & Zhang, 2019). When the controlling shareholders pledge equity, the company may make a merger decision (Li & Li, 2022), and the type of merger tends to be diversified, unrelated, and cash financing (Zhu, Xia, & Zheng, 2021).

2.2. M&A Investment

National policies determine M&A investments, especially overseas M&A investments. The Belt and Road Initiative proposed by the Chinese government and the 10-year plan of the Made in China 2025 strategy will upgrade the manufacturing industry. China will open wider to the outside world, make active use of global resources and markets, strengthen the global distribution of industries and international exchanges and cooperation, and raise the level of open development in the manufacturing industry. Du and Zhang (2018) pointed out that in response to the Belt and Road Initiative, China's foreign holding mergers and acquisitions have increased significantly in countries along the onshore Belt and Road Initiative. Regarding the characteristics of overseas M&A, Gao, Yu, and Wang (2012) found that the overseas M&A investment made by Chinese companies is to acquire high-tech enterprises or research and development institutions in order to acquire advanced technology and enhance its international competitiveness. Fuest, Hugger, Sultan, and Xing (2022) found that the acquiree of a Chinese company's overseas acquisition had lower profit and higher debt, which indicated that the acquirer had easy access to financing, leading to a careless investment strategy, and was more optimistic about improving the performance of the target company. China's companies are facing overcapacity and rising domestic production costs, which are the reasons for China's increasing overseas mergers and acquisitions (Du & Zhang, 2018). Erel, Liao, and Weisbach (2012) studied a sample of 56,978 cross-border mergers and found that geography, the quality of accounting disclosures, and bilateral trade increased the likelihood of a merger between countries. Companies in countries with higher stock market values, recent currency appreciation, and relatively high price-to-earnings ratios are often buyers, while companies from underperforming economies are often targets. The political resistance of the host country's national conditions, the accuracy of judgment on technology acquisition, and the enterprise's goals and the strength of the target technology capability are the main factors that attract attention in overseas mergers and acquisitions (Gao et al., 2012). Moreover, overseas mergers and acquisitions are more active in countries with better accounting standards and stronger shareholder protection. In addition, cash payments for mergers and acquisitions decreased as the level of shareholder protection in the acquiring country increased (Rossi & Volpin,

2004). This is in line with the view of Shleifer and Vishny (1986), who found more mergers and acquisitions in countries with stronger investor protection and more concentrated ownership.

The characteristics of managers also affect investment in mergers and acquisitions. Female directors who are not overconfident overestimate the acquisition revenue to a lesser extent, and even if they make an acquisition, the bid will be lower. As a result, the number of female directors is negatively correlated with the likelihood of a merger and the premium paid for the merger (Levi, Li, & Zhang, 2014). This is related to women's less confident attitude, reluctance to take risks, and caution. However, Levi, Li, and Zhang (2010) found a positive correlation between a young male Chief Executive Officer (CEO) and the offer. Further, the target male CEO will have a 4% increase in the likelihood of bidding. The age of male chief executives seems to represent physiological factors and men's pursuit of dominance, rather than the chief executive's vision or tenure-related experience.

The unique ownership structure of family companies means that their corporate governance and investment decisions are different from those of other listed companies (Ahmed, Elsayed, & Chen, 2023; Basu, Dimitrova, & Paeglis, 2009). Most of the family members are actively involved in the management and governance of the company, have a long-term investment perspective, and inherit the family investment strategy (Anderson, Mansi, & Reeb, 2003). Therefore, family companies use cash as a medium of exchange in merger and acquisition transactions to avoid dilution of control (Basu et al., 2009; King, Meglio, Gomez-Mejia, Bauer, & De Massis, 2022).

Given the different nature of corporate property rights, Du and Zhang (2018) pointed out that under the support of the Belt and Road Initiative policy, state-owned and non-state-owned companies have increased their acquisitions of target companies in the Mainland Silk Road countries. State-owned companies focus on infrastructure, while non-state-owned companies focus on non-infrastructure sectors. The acquisition of state-owned companies in China was significantly influenced by the Chinese government's Belt and Road Initiative and Made in China 2025 (Fuest et al., 2022).

From the perspective of the type of corporate investment, both direct capital investment and merger and acquisition investment will increase the assets of a company and improve its production capacity (Andrade & Stafford, 2004; Jovanovic & Rousseau, 2002). M&A investment is an activity with high fixed costs and low marginal adjustment costs. The ratio of M&A investment to market value and replacement cost is 2.6 times that of direct investment (Jovanovic & Rousseau, 2002). Similar conclusions include those reached by Gehringer (2015). Tobin's Q ratio has driven the wave of mergers and acquisitions; when the Q ratio is relatively high, companies tend to acquire other companies rather than make a direct investment. Ouyang and Szewczyk (2018) believe that the fixed costs of investment in mergers and acquisitions are higher, and companies with a higher Q will choose to invest in mergers and acquisitions. Moreover, the existence of direct investment and mergers and acquisitions has intensified tax competition. The increase in tax revenue led to the replacement of direct investment by mergers and acquisitions, thus reducing the total tax revenue (Becker & Fuest, 2011). In addition, based on the trade-off theory, Krishnamurti, Shams, and Chowdhury (2021) found a negative correlation between social responsibility and corporate merger and acquisition activities in order to avoid potential conflicts of interest with corporate shareholders, management, employees, customers, suppliers, and other stakeholders.

Regarding the impact of merger and acquisition investment, Ouyang and Szewczyk (2018) believe that M&A investment is beneficial to the long-term development of a company and increases shareholders' return on investment, in particular, positive short-term returns for shareholders of the target company (Cartwright & Schoenberg, 2006). In addition, M&A investment not only has a positive impact on the improvement of the innovation ability of M&A companies. Sevilir and Tian (2012) showed that the intensity of R&D and innovation results of the target companies before the merger have a positive impact on the innovation activities of the companies after the merger. But it also positively affects the innovation ability of the target companies and the motivation of small companies to innovate in order to be acquired by large companies (Phillips & Zhdanov, 2013). Finally, the interests of both parties in the merger and acquisition can be coordinated. Companies with large patent

portfolios and low research and development costs are the acquirers, while companies with high research and development costs and slow growth of patent output are the target companies. Synergies obtained in combination with innovation capabilities are an important driving force behind the acquisition (Bena & Li, 2014). As a result, access to technology has become one of the key drivers of M&A in China (Gao et al., 2012).

2.3. Literature Gap

The existing research conclusions on the impact of controlling shareholders' equity pledges on corporate investment are inconsistent. Moreover, the impact of equity pledges on corporate investment focuses on innovation investment and investment efficiency. The study of the overall impact of equity pledges on corporate investment is relatively general. Even if one aspect of corporate investment, innovation investment, is studied, it is not enough to reflect other aspects of corporate investment. Therefore, this paper studies the M&A aspect of corporate investment to fill in the blank of the impact of equity pledges on corporate M&A investment. Based on the macro policy of the Chinese government, the existing research is mainly focused on overseas M&A. There is little research on domestic M&A of Chinese companies, and there is a lack of literature on the determinants of investment in M&A. Therefore, this paper studies corporate M&A investment from the perspective of equity pledges in China's capital market, which makes up for the lack of determinants of domestic M&A investment.

2.4. Hypothesis Development

After the equity pledge, the controlling shareholders are exposed to the risks of control transfer and stock price collapse. The activities of the controlling shareholders revolve around supporting the stock price. The investment strategy is conservative to prevent the fluctuation of the stock price due to investment failure, resulting in margin call risk (Pang & Wang, 2020). M&A investment is a high-risk investment activity, and the success or failure of the project is highly uncertain. The payment of M&A brings financial pressure, and the synergistic effect after the M&A is not necessarily positive (Datta, Iskandar-Datta, & Raman, 2001). Moreover, when an equity pledge of the controlling shareholder occurs, it means that the company is faced with financing constraints, and merger and acquisition investments need a large amount of financial support. Therefore, this is not the appropriate time for the company to initiate merger and acquisition investment (Zhang & Peng, 2021). The controlling shareholders pay attention to the control of the company, prevent the pledgee from losing control of the company by selling the equity, and are more cautious regarding high-risk investments, such as corporate merger and acquisition decisions, thus reducing merger and acquisition investments. From the perspective of the pledgee, the equity pledge also faces the risk of the decline of the pledged share price. After the equity pledge, the pledgor transfers the market risk of the equity to the pledgee. The pledgee cares about the investment decision of the pledgor and plays an external governance role (Pan & Qian, 2019; Tao, Xiang, & Yi, 2021). The pledgee's supervision reduces the transfer of corporate resources by controlling shareholders, the possibility of mergers and acquisitions by related parties, and inefficient investment in high-priced acquisitions of non-performing assets.

Therefore, hypothesis H(a) is proposed: Controlling shareholders' equity pledges inhibit corporate M&A investments.

According to Li (2023), following an equity pledge, controlling shareholders focus on supporting the stock price. They employ various strategies, such as earnings management, share buybacks, conservative investment approaches, and mergers and acquisitions (M&A), to maintain short-term prices. M&A, in particular, is an effective method that utilizes the pledged funds for investment. This indicates the controlling shareholders' confidence in the success of the company's M&A projects, sends positive signals to the capital market and investors, and demonstrates optimism about the company's prospects, thereby improving the share price. M&A serves as a positive signal to investors, suggesting that the company is experiencing rapid growth and is well received by the market upon the announcement of acquisitions (Li, 2023; Matsusaka, 1993; Yang, 2019). Furthermore, Zhu et al. (2021)

argue that M&A investments enable controlling shareholders to effectively manage pledge risks and pursue long-term corporate value appreciation. Through mergers and acquisitions, companies can achieve economies of scale, synergies (Bena & Li, 2014), cost reductions, and long-term value enhancement (Ouyang & Szewczyk, 2018), which fundamentally stabilize the stock price. Additionally, after an equity pledge, controlling shareholders retain control rights while cash flow rights are vested in the pledgee. This separation of rights creates a significant agency problem, and controlling shareholders are motivated to seize private benefits by encroaching on the interests of minority shareholders (Rajhans, 2022; Yang, 2019). Related party transactions conceal under-investment transactions of mergers and acquisitions, high-priced acquisitions of the non-performing assets of related companies (Ke et al., 2019), or the expansion of the company's controlling resources through expansionary investments, thus "hollowing out" the listed companies by encroaching on the interests of other shareholders and obtaining private gains (Zhang & Peng, 2021).

Therefore, hypothesis H(b) is proposed: Controlling shareholders' equity pledges promote corporate M&A investments.

3. RESEARCH DESIGN

3.1. Sample and Data

The data used in this paper are from the China Stock Market & Accounting Research (CSMAR) database. The data processing software used in this paper is Stata 17. Considering the lag of the impact on company policies after equity pledges by controlling shareholders, the data selection of the equity pledges by the controlling shareholders lags by one period. Therefore, the data of listed companies from 2007 to 2020 were selected for the equity pledges of controlling shareholders, and the data for merger and acquisition investments were selected from 2008 to 2021. According to the following criteria for elimination and processing, a total of 14,055 independent variables and 13,118 dependent variables were obtained:

(1) Remove the companies that were ST and *ST in the current year to avoid the occurrence of abnormal values.

(2) Tail-shrink the data to eliminate abnormal observed values or missing related variables.

(3) Exclude financial and insurance companies.

(3) Exclude companies with discontinuous years.

3.2. Selection of Variables

3.2.1. Definition and Explanation of Main Variables

MA represents corporate mergers and acquisitions. This paper uses the method of Li and Li (2022) and Zhu et al. (2021) for reference, and uses the virtual variable MA_Dum to measure a company's M&A investment behavior; if yes, it is given a value of 1, and 0 otherwise. In addition, this paper adopts the MA_Amount as an alternative indicator of corporate mergers and acquisitions to ensure the robustness of the results. Considering that the influence of the equity pledge on the M&A investment is lagging, the equity pledge variable adopts the lag one-stage variable. Ple represents the controlling shareholders' equity pledges. Ple_Dum_{t-1} is a virtual variable of equity pledge, which is 1 if the company has an equity pledge and 0 if there is no equity pledge. Ple_Rate_{t-1} represents the proportion of the controlling shareholders' equity pledge (DeJong, Liao, & Xie, 2020). The specific explanations are detailed in Table 1.

3.2.2. Other Control Variables

See Table 1 for the control variables. In addition, year and industry dummy variables were used for regression analysis. Considering that the influence of the control variables on investment is lagging, the control variables are one-stage lagging variables.

Table 1. Measurement of variables.

Variable type	Variable name	Measure
Dependent variables	MA_Dum	If the corporation has M&A behavior in that year, the assigned value is 1, otherwise, it is 0
	MA_Amount	Natural logarithm of total merger and acquisition funds
Independent variables	Ple_Dum_{t-1}	If controlling shareholders pledge their equity, it has a value of 1, otherwise, it is 0.
	Ple_Rate_{t-1}	The cumulative pledged shares of the controlling shareholder account for the proportion of its shares
Control variables	$Size_{t-1}$	Ln (Total assets)
	Lev_{t-1}	Total liabilities divided by total assets
	ROA_{t-1}	Net profit/total assets
	$Cashflow_{t-1}$	Net cash flow from operating activities/total assets
	$Top10_{t-1}$	Ln (Shareholding ratio of the top ten shareholders)
	$FirmAge_{t-1}$	Ln (Current year - year of listing + 1)
	Year	The dummy variable is equal to a specific year, otherwise, it is equal to 0
	Industry	The dummy variable controls the influence of a specific industry

3.3. Model Construction

To test the hypotheses, the model constructed is as follows:

$$MA_{i,t} = \alpha_0 + \alpha_1 Ple_{i,t-1} + \alpha_2 \sum Controls_{i,t-1} + \sum Year + \sum Ind + \varepsilon_{i,t-1}$$

MA includes two indicators: whether there is an investment in merger and acquisition, MA_Dum, and the amount of the merger and acquisition, MA_Amount. To avoid estimation error, the model is estimated by different methods. When the variable to be explained is whether there is a merger or acquisition investment, the variable to be explained is virtual and the logit model is used for regression. The logit model is a statistical model used to estimate the probability of events, and the result can take one of two possible values. In this paper, whether there is a merger or not is a binary classification problem, so the logit model is suitable. Moreover, to test the robustness of the empirical results, the MA_Amount is adopted as an alternative indicator of corporate M&A behavior. When the variable to be explained is measured by the amount of the merger and acquisition, the variable to be explained is a continuous variable, which is tested by regression using the ordinary least squares (OLS) model.

Table 2. Descriptive statistics.

Variables	Obs.	Mean	Std. dev.	Min.	Max.
MA_Dum	13,118	0.188	0.391	0	1
MA_Amount	13,118	3.495	7.311	0	25.946
Ple_Rate_{t-1}	14,055	0.067	0.174	0	1
Ple_Dum_{t-1}	14,055	0.244	0.430	0	1
$Size_{t-1}$	14,055	22.569	1.366	19.734	26.104
Lev_{t-1}	14,055	0.488	0.187	0.051	0.895
ROA_{t-1}	14,055	0.043	0.052	-0.234	0.224
$Cashflow_{t-1}$	14,055	0.054	0.071	-0.174	0.246
$Top10_{t-1}$	14,055	0.546	0.154	0.127	0.986
$FirmAge_{t-1}$	14,055	2.903	0.336	1.609	3.497

4. RESULTS

4.1. Descriptive Statistics

Table 2 is a descriptive statistical analysis. The standard deviation of the merger amount is greater than the average value, which indicates that the funds paid by different listed companies for mergers are quite different.

4.2. Correlation

Table 3 shows the correlation coefficient between each variable, and performs significance tests at the levels of 1%, 5%, and 10%, respectively. The results show that there is a certain correlation between each variable. The

correlation coefficient between each variable is less than 0.8. Thus, it can be preliminarily assumed that there is no multicollinearity among the explanatory variables, and the next step of regression analysis can be performed.

4.3. Regression

In Table 4, Ple_Rate_{t-1} has a positive effect on MA_Dum, and it is significant at the level of 10%. When the Ple_Rate_{t-1} increases by one percentage point, MA_Dum increases by 0.245 percentage points. Ple_Dum has a positive effect on MA_Dum, which is significant at 1%. When Ple_Dum increases by one percentage point, MA_Dum increases by 0.24 percentage points. This indicates that the equity pledge of the controlling shareholder has a positive impact on the investment in a merger and acquisition. These results are consistent with those of Li and Li (2022) and Zhu et al. (2021).

5. FURTHER ANALYSIS

5.1. Ownership Nature Effect

In Table 5, the Ple_Rate_{t-1} and Ple_Dum_{t-1} of state-owned companies have a significant positive impact on MA_Dum, while the Ple_Rate and Ple_Dum of non-state-owned companies have no significant impact on MA_Dum. Classified according to the nature of property rights, state-owned and non-state-owned companies deal with share pledges completely differently. Non-state-owned companies are usually controlled by individuals or families. State-owned companies are supervised by the State-owned Assets Supervision and Administration Commission. Before the pledge of equity, the State-owned Assets Supervision and Administration Commission stipulates that the number of pledged shares of state-owned listed companies should be less than or equal to half of their shareholding. During the process of an equity pledge, the State-owned Assets Supervision and Administration Commission monitors the share pledge activities of the state-owned companies to maintain continuous control over the shares. When the stock price collapses and the pledged shares of the state-owned company face the risk of liquidation, the state-owned shares are not allowed to be directly transferred to the lenders, and only after the approval of the Ministry of Finance can the shares be auctioned in the open market to repay the pledgor. As a result, compared with non-state-owned companies, state-owned companies can withstand greater risks of stock price collapse and transfer of control and are more likely to make investments in mergers and acquisitions (Zhu et al., 2021).

Table 3. Pearson correlation.

Variable	MA_Dum	MA_Amount	Ple_Rate_{t-1}	Ple_Dum_{t-1}	$Size_{t-1}$	Lev_{t-1}	ROA_{t-1}	$\lvert Cashflow_{t-1}$	$Top10_{t-1}$	$FirmAge_{t-1}$
MA_Dum	1									
MA_Amount	0.993***	1								
Ple_Rate_{t-1}	0.020**	0.017*	1							
Ple_Dum_{t-1}	0.045***	0.044***	0.680***	1						
$Size_{t-1}$	0.035***	0.060***	-0.122***	-0.062***	1					
Lev_{t-1}	0.072***	0.083***	0.025***	0.027***	0.421***	1				
ROA_{t-1}	0.024***	0.021**	-0.057***	-0.050***	-0.015*	-0.367***	1			
$Cashflow_{t-1}$	-0.059***	-0.062***	-0.034***	-0.040***	0.030***	-0.175***	0.396***	1		
$Top10_{t-1}$	-0.024***	-0.015*	-0.142***	-0.119***	0.306***	0.047***	0.182***	0.144***	1	
$FirmAge_{t-1}$	-0.058***	-0.049***	0	0.037***	0.279***	0.049***	-0.140***	-0.051***	-0.163***	1

Note: ***, ** and * represent statistically significant levels of 1%, 5%, and 10%, respectively. MA_Dum and MA_Amount represent corporate mergers and acquisitions. Ple_Ratet-1 and Ple_Dumt-1 represent controlling shareholders' equity pledges. All others are control variables.

Table 4. Benchmark regression.

Variable	MA_Dum	MA_Dum
Ple_Rate_{t-1}	0.245*	
	(1.90)	
Ple_Dum_{t-1}		0.240***
		(4.60)
$Size_{t-1}$	0.104***	0.107***
	(4.46)	(4.59)
Lev_{t-1}	0.817***	0.787***
	(4.86)	(4.68)
ROA_{t-1}	3.963***	3.963***
	(7.07)	(7.07)
$Cashflow_{t-1}$	-2.233***	-2.216***
	(-6.15)	(-6.10)
$Top10_{t-1}$	-0.951***	-0.930***
	(-5.64)	(-5.52)
$FirmAge_{t-1}$	-0.430***	-0.419***
	(-3.97)	(-3.86)
Year	Control	Control
Industry	Control	Control
_cons	-2.027***	-2.167***
	(-3.69)	(-3.93)
N	13098	13098
R^2	0.0358	0.0372

Note: *** and * represent statistically significant levels of 1% and 10%, respectively.

Table 5. Ownership nature effect.

Dependent variable	MA_Dum	MA_Dum	MA_Dum	MA_Dum
Company properties	State-owned firms	Non-state-owned firms	State-owned firms	Non-state-owned firms
	(1)	(2)	(3)	(4)
Ple_Rate_{t-1}	0.716***	-0.224		
	(3.05)	(-1.34)		
Ple_Dum_{t-1}			0.281***	-0.005
			(3.31)	(-0.07)
$Size_{t-1}$	0.170***	0.105***	0.169***	0.112***
	(5.52)	(2.68)	(5.49)	(2.86)
Lev_{t-1}	0.967***	0.689**	0.949***	0.659**
	(4.33)	(2.57)	(4.25)	(2.46)
ROA_{t-1}	3.958***	2.822***	3.926***	2.884***
	(4.89)	(3.53)	(4.85)	(3.61)
$Cashflow_{t-1}$	-2.099***	-2.512***	-2.072***	-2.507***
	(-4.31)	(-4.45)	(-4.26)	(-4.45)
$Top10_{t-1}$	-1.297***	-0.394	-1.304***	-0.368
	(-5.48)	(-1.58)	(-5.51)	(-1.48)
$FirmAge_{t-1}$	-0.108	-0.703***	-0.104	-0.718***
	(-0.69)	(-4.57)	(-0.66)	(-4.68)
Year	Control	Control	Control	Control
Industry	Control	Control	Control	Control
_cons	-4.082***	-1.609*	-4.083***	-1.723**
	(-5.40)	(-1.84)	(-5.40)	(-1.97)
N	8200	4884	8200	4884
R^2	0.0420	0.0477	0.0422	0.0474

Note: ***, ** and * represent statistically significant levels of 1%, 5% and 10%, respectively.

5.2. Industry Effect

Table 6 shows that the Ple_Rate_{t-1} and Ple_Dum_{t-1} in the non-manufacturing industry have a significant positive impact on MA_Dum, while the Ple_Rate_{t-1} and Ple_Dum_{t-1} in the manufacturing industry have no

significant impact on MA_Dum. The equity pledges are mainly concentrated in the manufacturing industry (Fabisik, 2019; Gui, Yang, & Zhu, 2022; Huang & Xue, 2016), which has a high share-pledging ratio and is more exposed to stock price crashes and control transfer risk than the non-manufacturing industry. The non-manufacturing industry can bear more risks of M&A investment; therefore, compared with the manufacturing industry, the non-manufacturing controlling shareholders' equity pledges have a significant positive impact on M&A investment.

Table 6. Industry effect.

Dependent variable	MA_Dum	MA_Dum	MA_Dum	MA_Dum
Industry nature	Manufacturing enterprises	Non-manufacturing enterprises	Manufacturing enterprises	Non-manufacturing enterprises
	(1)	(2)	(3)	(4)
Ple_Rate_{t-1}	0.022	0.593***		
	(0.13)	(3.00)		
Ple_Dum_{t-1}			0.177***	0.340***
			(2.59)	(4.17)
$Size_{t-1}$	0.074**	0.139***	0.078**	0.140***
	(2.26)	(4.06)	(2.40)	(4.09)
Lev_{t-1}	0.373*	1.487***	0.327	1.464***
	(1.67)	(5.75)	(1.46)	(5.66)
ROA_{t-1}	3.331***	4.921***	3.304***	4.985***
	(4.63)	(5.24)	(4.60)	(5.31)
$Cashflow_{t-1}$	-1.906***	-2.557***	-1.887***	-2.518***
	(-3.55)	(-5.11)	(-3.51)	(-5.02)
$Top10_{t-1}$	-0.913***	-0.951***	-0.873***	-0.963***
	(-3.88)	(-3.87)	(-3.72)	(-3.92)
$FirmAge_{t-1}$	-0.617***	-0.104	-0.607***	-0.093
	(-4.23)	(-0.63)	(-4.16)	(-0.56)
_cons	-1.526**	-3.745***	-1.702**	-3.848***
	(-2.17)	(-4.53)	(-2.42)	(-4.64)
Year	Control	Control	Control	Control
Industry	Control	Control	Control	Control
N	7483	5615	7483	5615
R^2	0.0204	0.0566	0.0213	0.0581

Note: ***, ** and * represent statistically significant levels of 1%, 5% and 10%, respectively.

5.3. Pledge Ratio Effect

Table 7 shows that the Ple_Rate_{t-1} and Ple_Dum_{t-1}, which have low pledge ratios, have a more significant positive impact on MA_Dum than those with high pledge ratios. Merger and acquisition investment is a high-risk investment activity, and companies with high equity pledges are more likely to face the risk of stock price collapse and control transfer if the merger fails. Therefore, the controlling shareholders of companies with low pledge ratios are more likely to choose merger and acquisition investment activities after the equity pledge.

5.4. Robustness Test

Table 8 contains the results of the robustness test. First, referring to the research by S. Chen, Lu, Jiang, and Wang (2015), MA_Amount is used instead of MA_Dum for the OLS regression, and the return results are shown in columns (1) and (2). The results are consistent with the main regression and are therefore considered to be robust and reliable. Second, referring to the research by Peng and Zhang (2022), the probit model replaces the logit model for regression. Columns (3) and (4) contain the return results, which are consistent with the main regression and are thus considered to be robust and reliable. Finally, referring to the study by He and Su (2011), which is also a study of endogenous effects, the GMM is used to replace the OLS model for regression, and the controlling

shareholder equity pledge variable lagging behind one phase is used as the instrument variable of current controlling shareholder equity pledge for regression (see columns (5) and (6) for the return results). The results are basically consistent with the main regression, so are considered to be robust and reliable.

Table 7. Pledge ratio effect.

Dependent variable	MA_Dum	MA_Dum	MA_Dum	MA_Dum
Pledge ratio	High pledge ratio	Low pledge ratio	High pledge ratio	Low pledge ratio
	(1)	(2)	(3)	(4)
Ple_Rate_{t-1}	-0.033 (-0.16)	9.780*** (3.95)		
Ple_Dum_{t-1}			0.000 (.)	0.463*** (4.56)
$Size_{t-1}$	0.152*** (2.61)	0.102*** (3.97)	0.153*** (2.68)	0.101*** (3.93)
Lev_{t-1}	0.217 (0.60)	0.929*** (4.85)	0.213 (0.59)	0.917*** (4.78)
ROA_{t-1}	2.686** (2.33)	4.196*** (6.52)	2.690** (2.33)	4.191*** (6.52)
$Cashflow_{t-1}$	-1.746** (-2.21)	-2.325*** (-5.63)	-1.750** (-2.22)	-2.337*** (-5.66)
$Top10_{t-1}$	-0.595* (-1.65)	-1.040*** (-5.40)	-0.590 (-1.64)	-1.047*** (-5.43)
$FirmAge_{t-1}$	-0.364 (-1.50)	-0.439*** (-3.56)	-0.367 (-1.52)	-0.438*** (-3.56)
Year	Control	Control	Control	Control
Industry	Control	Control	Control	Control
_cons	-2.831** (-2.12)	-2.098*** (-3.41)	-2.865** (-2.18)	-2.076*** (-3.37)
N	2653	10443	2653	10443
R^2	0.0469	0.0386	0.0469	0.0391

Note: ***, ** and * represent statistically significant levels of 1%, 5% and 10%, respectively.

Table 8. Robustness test.

Dependent variable	MA_Amount	MA_Amount	MA_Dum	MA_Dum	MA_Amount	MA_Amount
	(1) OLS model	(2) OLS model	(3) PROBIT model	(4) PROBIT model	(5) GMM model	(6) GMM model
Ple_Rate_{t-1}	0.666* (1.80)		0.145* (1.95)		0.091*** (2.84)	
Ple_Dum_{t-1}		0.683*** (4.60)		0.136*** (4.55)		0.059*** (4.99)
$Size_{t-1}$	0.415*** (6.43)	0.422*** (6.55)	0.059*** (4.39)	0.060*** (4.51)	0.017*** (5.09)	0.017*** (5.14)
Lev_{t-1}	2.059*** (4.58)	1.976*** (4.40)	0.454*** (4.81)	0.437*** (4.64)	0.111*** (4.78)	0.106*** (4.56)
ROA_{t-1}	10.266*** (6.97)	10.256*** (6.97)	2.154*** (6.94)	2.152*** (6.93)	0.572*** (7.24)	0.568*** (7.22)
$Cashflow_{t-1}$	-6.657*** (-6.51)	-6.598*** (-6.46)	-1.259*** (-6.08)	-1.248*** (-6.02)	-0.355*** (-6.26)	-0.349*** (-6.17)
$Top10_{t-1}$	-2.560*** (-5.50)	-2.486*** (-5.35)	-0.544*** (-5.69)	-0.533*** (-5.58)	-0.136*** (-5.40)	-0.133*** (-5.30)
$FirmAge_{t-1}$	-1.180*** (-3.87)	-1.151*** (-3.77)	-0.245*** (-3.96)	-0.238*** (-3.85)	-0.065*** (-3.87)	-0.062*** (-3.68)
Year	Control	Control	Control	Control	Control	Control
Industry	Control	Control	Control	Control	Control	Control
_cons	-0.727 (-0.47)	-1.084 (-0.70)	-1.179*** (-3.75)	-1.255*** (-3.98)	0.002 (0.03)	-0.023 (-0.25)
N	13118	13118	13098	13098	13118	13118
R^2	0.041	0.042	0.0356	0.0369	0.035	0.036

Note: *** and * represent statistically significant levels of 1% and 10%, respectively.

6. CONCLUSION

This study explores the relationship between controlling shareholders' equity pledges and M&A investments, and the findings indicate a positive correlation. Furthermore, the cross-sectional analysis revealed that the impact of controlling shareholders' equity pledges on M&A investments is particularly pronounced in state-owned companies, non-manufacturing companies, and companies with low equity pledge ratios. This suggests that state-owned companies, non-manufacturing companies, and companies with low equity ratios are more inclined to engage in mergers and acquisitions. Lastly, the study employs an OLS regression model, replaces the dependent variables, and utilizes the probit model and the GMM method to demonstrate the stability and reliability of the findings.

6.1. Implication

The implication is that controlling shareholders' equity pledges positively affect M&A investment. On the one hand, after an equity pledge, shareholders use M&A investment to send a positive signal to the market to support the stock price. On the other hand, it is a means of encouraging shareholders to use M&A investment to encroach on the interests of other shareholders to serve their private interests. Therefore, investors should pay attention to the real purpose of M&A investment and safeguard their interests.

6.2. Limitation

The pledges of controlling shareholders' equity promote M&A investment on the basis that the funds pledged are used for company mergers and acquisitions. There is no mandatory disclosure of the use of funds obtained by the controlling shareholders' equity pledges, and data on the use of funds cannot be obtained, which may affect the research results. In addition, there is no research on the heterogeneity of M&A investment based on the types of M&A and the payment methods of M&A funds.

6.3. Policy Suggestion

The securities regulatory authorities should formulate policies to regulate the disclosure of information on equity pledges and require companies to disclose the purpose and use of funds after an equity pledge. They should also supervise the use of pledged funds throughout the whole process and evaluate the performance of pledged funds to truly protect the interests of small and medium shareholders, pledgees, and other stakeholders.

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