

# Research on the Influence of Equity Pledge of Controlling Shareholders on Enterprise Innovation: Based on the Real Surplus Management Perspective

Guangqiang Han and Yingxue Wang  
*School of Economics, Bohai University, Jinzhou, Liaoning, China*

**Keywords:** Equity Pledge, Real Surplus Management, Enterprise Innovation, Mechanism Analysis, Intermediary Effect.

**Abstract:** The article samples Chinese A-share listed companies from 2007 to 2020, and verifies the relationship between the controlling shareholder equity pledge, surplus management and enterprise innovation by using empirical research methods. The study found that the implementation of equity pledge by the controlling shareholders will reduce the degree of innovation of enterprises, and the real surplus management will play a partial intermediary role in the relationship between the two. The research conclusion is helpful to improve the economic consequence theory of equity pledge.

## 1 INTRODUCTION

The Fifth Plenary Session of the 19th CPC Central Committee proposed that the 14th Five-Year Plan period must be innovation-driven and high-quality supply. Although research and innovation will lead to a large increase in enterprise costs in the short term, it is related to the long-term development of enterprises. According to the statistics of wind database, as of November 26, 2021, the number of pledged shares in the A-share market is 429.87 billion shares, and the equity pledge situation is generally more common. When the controlling shareholder makes a large proportion of the equity pledge to finance, motivated to maintain control, it tends to use its own control for various surplus management activities, so as to stabilize the stock price. Cutting innovation investment is an effective method of real surplus management.

Some scholars have analyzed the relationship between equity pledge and enterprise innovation from the perspective of internal control, management risk preference and institutional environment. From the perspective of real surplus management, this paper discusses the impact of equity pledge on enterprise innovation, which provides a richer perspective.

## 2 LITERATURE REVIEW AND HYPOTHESES ARE PRESENTED

### 2.1 Equity Pledge and Enterprise Innovation

Most scholars believe that equity pledge and enterprise innovation are a linear negative correlation. For example, Zhang Ruijun et al (2017) believe that the negative relationship between the controlling shareholder equity pledge and the enterprise R & D investment (Zhang, et al, 2017), while Li Changqing et al (2018) believes that such will only occur when the equity pledge rate is higher and the closer to the liquidation line (Li, et al, 2018). Wenwen et al. (2018) believe that the equity pledge of the controlling shareholders in the high-tech industry has a stronger inhibitory effect on enterprise innovation than (Wen, et al, 2018). Some scholars believe that the relationship between the two is nonlinear. Xu Weilong et al (2020) believe that with the increase of the pledge ratio, the innovation ability increases first and then reduces the (Xu, et al, 2020). Based on this, we propose the hypotheses 1a, 1b:

H1a: Equity pledge of major shareholders is negatively related to enterprise innovation.

H1b: Equity pledge of major shareholders and enterprise innovation is not a linear negative relationship.

## 2.2 Equity Pledge and Surplus Management

Surplus management activities are a relatively common legal market value management behavior in listed companies, which is divided into accrued surplus management and real surplus management. Sun Haitao et al. (2020) believe that the companies that make the equity pledge will take more real surplus management activities to adjust the surplus (Sun, et al, 2020). Li Xiaodong et al (2020) also believe that the equity pledge of major shareholders is significantly negatively related to the degree of accrued surplus management, and significantly positively related to the degree of real surplus management(Li, et al, 2020).The equity pledge of the controlling shareholder that has been released within the year has no significant impact on the real surplus management degree of the company (Xie, et al, 2018).Based on this, the hypothesis 2 is proposed:

H2: The equity pledge of major shareholders has a positive relationship with the real surplus management.

## 2.3 Surplus Management and Enterprise Innovation

Once the enterprise has the need for surplus management activities, it will pay special attention to the large expenses in the surplus management activities. Long payback and costly R & D innovation activities will be reduced by surplus management activities. When the degree of surplus management is reduced, the agency problems and financing constraints are reduced, so that the enterprise innovation behavior can be significantly improved (Yu, et al, 2018). Businesses with R & D expenses will engage in surplus management for real R & D trading activities(Xiao, Zhou, 2012).The innovation strategy of enterprises is divided into radical and conservative types. The higher the real surplus management degree of the enterprise, the lower the intensity of its R & D expenditure, and the enterprise will adopt a more conservative innovation strategy (Dai 2016).

In general, equity pledge has led to an increase in surplus management, and real surplus management will be based on cutting corporate innovation. In this way, the action path of "equity pledge, one real surplus management and one enterprise innovation"

is formed. Thus, we propose the hypothesis that the 3:

H3: If H1a is established, the real surplus management plays an intermediary role between equity pledge and enterprise innovation.

## 3 RESEARCH DESIGN

### 3.1 Sample Selection and Data Sources

All the data in this paper are from GuoTai'an, and the equity pledge data of major shareholders at the end of 2007-2020 is obtained through manual sorting. Surplus management requires data from the previous two years, which began in 2005.Excluding the financial industry, missing data, and ST, \*ST, and PT, all continuous variables were processed with Winsorize.

### 3.2 Variable-Definition

#### 3.2.1 Explanatory Variable

The explanatory variable is the major shareholder's equity pledge. According to the existing literature, through the sorting of the pledge data of the current year, the judgment standard is whether there is an equity pledge by the major shareholder at the end of the year, and the value is 1, and the value is 0. It does not include the samples released in the current year. Enterprises that did not update the pledge data in the current year are consistent with the equity pledge in previous years.

#### 3.2.2 Explained Variable

The ratio of R & D investment and operating income is taken as a measure of enterprise innovation:

$$\text{Radint} = \frac{\text{Total enterprise R \& D expenditure}}{\text{operating income}} \quad (1)$$

The larger the calculated Radint value indicates that the higher the enthusiasm of the enterprise to implement the enterprise innovation.

#### 3.2.3 Mediating Variable

This paper uses real surplus management data from GuoTaian database, represented by DREM. The calculated DREM value is greater than zero and the greater the degree of upward real surplus management; the DREM value is less than zero and

the smaller, the higher the degree of downward real surplus management.

### 3.2.4 Controlled Variable

Based on previous research results related to equity pledge and earnings management, the following variables are used as control variables: (1) Nature of property rights (SOE): Based on whether it is a state-owned enterprise, the value is 1 if it is a state-owned enterprise, and 0 if it is not. (2) Shareholding ratio of the largest shareholder (Top1): This variable is used to represent the concentration of ownership. It is measured by the proportion of the shares held by the largest shareholder to the total shares of the listed company. Generally, the larger the proportion, the higher the degree of equity concentration. (3) Audit quality (Big4): The Big Four accounting firms are relatively authoritative accounting firms. It is measured according to whether the listed company is audited by the Big Four accounting firm at the end of the year. (4) Size of the company (Size): The size of the company is measured by taking the natural logarithm of the company's total assets. The larger the indicator is, the larger the company is. (5) Growth rate of operating income (Growth): It is used to express the development ability of the enterprise. It is measured by dividing the operating income of the current year by the operating income of the previous year and subtracting one. (6) Number of directors (Board): Indicates the size of the board of directors of the listed company, which is measured by taking the natural logarithm of the number of directors of the company. (7) Tobin's Q value (Tobin): This variable is used to measure the company's performance. It is measured by the ratio of the company's market value to the replacement cost of assets. At the same time, two dummy variables of year and industry are defined to control their effects.

### 3.3 Model Specification

In this paper, the stepwise test method of mediation test is used to test whether the total effect coefficient is significant, that is, whether there is a significant relationship between the independent variable and the dependent variable. If significant, proceed to subsequent analyses, if not, mediation analysis is terminated. Test whether the effect of the independent variable acting on the mediating variable is significant; if it is significant, continue the subsequent test, otherwise stop the analysis, and the mediating effect does not exist; test whether the effect of the mediating variable acting on the dependent

variable is significant; if significant, continue the subsequent test, otherwise stop the analysis, the mediating effect does not exist; test whether the direct effect is significant. When the first two items are significant, if it is not significant, there is a complete mediation effect (Judd, Kenny, 1981), otherwise there is a partial mediation effect (Baron & Kenny 1986).

The following models are set up to conduct the mediation effect test of assumptions 1,2 and 3, and then use the Bootstrap method if the step-wise test is not significant.

Hypothesis 1a、1b was verified to construct the following multiple linear regression model:

$$Radinti, t = \beta_0 + \beta_1 Pledgei, t + \beta_2 Soei, t + \beta_3 Roai, t + \beta_4 Top1i, t + \beta_5 Big4i, t + \beta_6 Sizei, t + \beta_7 Growthi, t + \beta_8 Boaedi, t + \beta_9 Tobini, t + \sum Y + \sum IND + \epsilon \quad (2)$$

Hypothesis 2 was verified to construct the following multiple linear regression model:

$$Pledgei, t = \beta_0 + \beta_1 DREMi, t + \beta_2 Soei, t + \beta_3 Roai, t + \beta_4 Top1i, t + \beta_5 Big4i, t + \beta_6 Sizei, t + \beta_7 Growthi, t + \beta_8 Boaedi, t + \beta_9 Tobini, t + \sum Y + \sum IND + \epsilon \quad (3)$$

To verify hypothesis 3, the following multiple linear regression model was constructed by combining the models (2) and (3):

$$Radinti, t = \beta_0 + \beta_1 Pledgei, t + \beta_2 DREMi, t + \beta_3 Soei, t + \beta_4 Roai, t + \beta_5 Top1i, t + \beta_6 Big4i, t + \beta_7 Sizei, t + \beta_8 Growthi, t + \beta_9 Boaedi, t + \beta_{10} Tobini, t + \sum Y + \sum IND + \epsilon \quad (4)$$

## 4 EMPIRICAL ANALYSIS

### 4.1 Descriptive Statistics

The descriptive statistics of the variables in this paper are shown in Table 2. The minimum value of R & D investment of listed companies is 0, and the maximum value is 251.6%. It can be seen that there is a large gap in the innovation level of different listed companies, and there is an extreme phenomenon of excessive innovation investment in that year. For example, in Junshi Biology in 2019 and 2020, this value reached 122.06% and 112.72%. The median is 3.4%, indicating that the overall innovation level of listed companies is low, and the innovation impetus is insufficient. The average equity pledge ratio (Pledge) of controlling shareholders is 44.5%, indicating that the equity pledge situation of controlling shareholders of listed companies is relatively common.

The Variance Inflation Factor test refers to the ratio of the variance when there is multicollinearity

among the explanatory variables to the variance when there is no multicollinearity between the explanatory variables. The larger the VIF, the more serious the collinearity is. The judgment method shows that when  $0 < VIF < 10$ , there is no multicollinearity among the variables. It can be seen from Table 3 that after the VIF test, the VIF values of each variable (dummy variable year, industry controlled) are all less than 2, and it can be judged that there is no multicollinearity between the variables.

Table 1: Descriptive statistics.

Variable	Descriptive Statistical Items				
	Mean	Median	SE	Min	Max
Radint	0.044	0.034	0.054	0.000	2.516
Pledge	0.445	0.000	0.497	0.000	1.000
DREM	-0.002	0.009	0.165	-0.652	0.496
SOE	0.344	0.000	0.475	0.000	1.000
Top1	0.335	0.316	0.137	0.085	0.729
Big4	0.048	0.000	0.213	0.000	1.000
Size	22.202	22.044	1.177	19.982	26.190
Growth	0.146	0.105	0.296	-0.493	2.276
Board	2.150	2.197	0.169	1.792	2.708
Tobin	2.018	1.660	1.125	0.860	8.391

## 4.2 Regression Analysis

The first column of Table II reports the regression results of the equity pledge on the innovation input and innovation output of the first controlling shareholder, with the regression coefficient of -0.003 at the 1% level, supporting the assumption of H1a. The second column of Table II reports a significant positive correlation between the equity pledge of major shareholders and the real surplus management at 1%, with a coefficient of 0.025, supporting the assumption of H 2. In the third column of Table II, after adding surplus management, equity pledge and enterprise innovation are significantly negatively related at 5%, and the coefficient becomes -0.002; real surplus management and enterprise innovation at 1%, with the coefficient of -0.022, indicating that surplus management plays part of the intermediary between equity pledge and enterprise innovation. Taken together, the regression results support the hypothesis of H 3 that there is a partial mediation effect.

Table 2: Regression analysis.

Variable	Regression Analysis Results		
	Radint	DREM	Radint
Pledge	-0.003***	0.025***	-0.002**
	(0.001)	(0.003)	(0.001)
DREM			-0.022***
			(0.002)
controlled variable	control	control	control
year	control	control	control
trade	control	control	control
constant	0.091***	0.189***	0.095***
	(0.010)	(0.035)	(0.010)
observes	17,780	17,780	17,780
R-squared	0.239	0.068	0.243
Standard errors in parentheses			
*** p<0.01, ** p<0.05, *p<0.1			

## 5 RESEARCH CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Research Conclusions

This paper uses the data of A-share listed companies for empirical analysis, and the following research conclusions: the larger the equity pledge ratio of the major shareholders, the higher the surplus management degree, the less sufficient funds to invest in research and development; or reduce R & D expenditure through surplus management, the enterprise innovation cannot be effectively implemented.

### 5.2 Recommendations

Relevant countermeasures and suggestions in this paper can be put forward from the following aspects: First, listed enterprises should try to diversified financing methods. Although equity pledge is a fast and efficient financing method, financing through equity pledge has risks. Enterprises should try diversified financing methods to reduce the risk of drastic fluctuations in enterprise stock prices. Secondly, the listed enterprises should reduce the real surplus management activities. We should give full play to the role of internal and external supervision of enterprises, ensure that the quality of surplus

information is at a relatively high level, and improve the sustainability of enterprise development. Finally, listed enterprises should maintain or even increase their innovation efforts. For the long-term development of enterprises, only continuous innovation can have the competitiveness of the long-term development of the enterprise. Only by making continuous innovation, keeping up with or even leading the trend of continuous change of the industry can we maintain the long-term development of the enterprise.

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