



Equity Pledge and Total Factor Productivity under the Background of Digital Economy

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Abstract

In the process of economic globalization, the digital economy is the only way for China to transform from big to strong. The high-quality development of the digital economy has become an important means of changing the economic and social development model. Under the background of digital economy, this paper takes A-share listed companies in China's capital market from 2011 to 2020 as samples, and empirically tests the relationship between controlling shareholders' equity pledge and total factor productivity by using STATA15.0. It is found that the equity pledge significantly reduces the total factor productivity of the listed companies. The higher the equity pledge of the controlling shareholder, the easier it is to encroach on the interests of the listed company or other shareholders, and reduce the total factor productivity of the company. The conclusion is helpful for the listed companies and regulators to have a more comprehensive understanding of the economic consequences of equity pledge.

Keywords: *Digital Economy, Equity Pledge, Total Factor Productivity.*

1. INTRODUCTION

In the continuous development of China's economy and society, the mobile Internet and digital technologies have emerged as the times require, and the scale of the global digital economy is also expanding. As a new economic form, the digital economy is gradually changing the production and business models of traditional industries. Whether it is to promote the optimization and upgrading of the industrial structure, or from the perspective of improving the happiness of the people, it is required to accelerate the pace of developing the digital economy and actively build a "digital China". The report of the 19th National Congress of the Communist Party of China pointed out: "my country's economy has shifted from a stage of high-speed growth to a stage of high-quality development, and is in a critical period of transforming the development mode, optimizing the economic structure, and transforming the driving force of growth." We must adhere to quality first and efficiency first, and take supply-side structural reform as the main line to promote economic development in terms of quality, efficiency, and power, and improve total factor productivity." Total factor productivity (TFP) is essentially a resource allocation efficiency. The improvement of total factor productivity is the part of

growth that is not contributed by production factors such as capital and labor, and is the source of power for improving labor productivity and achieving high-quality development (Cai Fang^[1],2013; Chen Xi^[2],2020). However, the total factor productivity of China is currently at a relatively low level. Scholars have carried out a series of studies on total factor productivity from both macro and micro perspectives. It is found that its growth may come from government assistance, technological innovation and management efficiency, but few scholars study total factor productivity from the perspective of equity pledge.

Equity pledge refers to a financing behavior in which shareholders pledge their company shares as pledge objects to financial institutions such as banks and securities companies to obtain funds. Compared with other financing methods, equity pledge is favored because of its simple procedures, low threshold and no impact on shareholders' control. According to the Wind database, as of the end of 2020, in the A-share market, the number of pledged shares reached 289.7 billion shares, and the total pledged market value reached 263 million yuan. It can be seen that equity pledge has become one of the important financing methods in China's capital market. However, equity pledge also has huge risks, because during equity pledge, in order to protect the interests of the pledgee, a

certain liquidation line will be set. When the stock price falls to a certain level, if the pledged shareholders cannot make up their positions or add security, the pledgee has the right to forcibly liquidate the positions, which will cause the pledged shareholders to lose their pledged equity, or even their control.

In order to prevent shareholders from losing control due to a drop in the stock price, shareholders will use the raised funds to maintain the stability of the stock price after the equity pledge. For projects that require long-term investment or high risk, such as improving production structure and corporate innovation, it will not invest too much capital, which may affect the long-term development of the company.

This paper uses A-share listed companies in China's capital markets from 2011 to 2020 as a sample, and empirically tests the relationship between the equity pledge behavior of controlling shareholders and total factor productivity.

2. MECHANISM ANALYSIS AND HYPOTHESIS

Since the controlling shareholder pledges its equity, it does not reduce its control over the company, resulting in the separation of control and cash flow rights. The interests of controlling shareholders and minority shareholders are no longer consistent, and the second type of agency problem appears (Yeh et al[3], 2003; Lee and Yeh[4], 2004). When the equity pledge ratio is higher, the degree of separation of control rights and cash flow rights is greater. For their own interests, controlling shareholders will increase the hollowing out of listed companies and encroach on the interests of small and medium shareholders. Such as the use of related transactions, guarantee transfer of assets, etc. When the company is hollowed out by the controlling shareholder, the controlling shareholder takes more of the listed company's resources for himself. Affect the company's normal production and operation activities, impact the original resource allocation method, and inhibit the company's total factor productivity. And the higher the pledge ratio of controlling shareholders, the more serious the hollowing behavior, and the greater the negative impact on total factor productivity.

On the other hand, when the controlling shareholder pledges the equity, the pledgee will set a certain liquidation line. That is, when the stock price falls to the liquidation line, if the pledged shareholder cannot make up the position or make additional guarantees, the pledgee has the right to forcibly liquidate the position. This can cause the pledged shareholders to lose their pledged equity, or even their control. This makes the equity pledge to have a certain risk of transfer of control rights, and control rights can bring rich private interests to the controlling equity. Therefore, after the equity pledge, the controlling shareholder will take a series of measures to

maintain the stability of the company's performance and stock price in order to maintain its control. or the management will reduce investment in research and development, upgrade production systems, combine production factors, and improve production efficiency. These measures will affect the long-term development of enterprises in the long run. And the higher the pledge ratio of controlling shareholders, the greater the risk of stock price crash, shareholders are more willing to invest funds in projects that maintain stock price stability in the short term.

Whether it is the agency problem caused by the separation of control rights and cash flow rights, or a series of countermeasures taken by controlling shareholders to prevent the transfer of control rights. All will hinder the normal business activities of enterprises, affect the quality of enterprise development, distort the resource allocation of enterprises, and reduce total factor productivity.

To sum up, Hypothesis 1 can be put forward: the controlling shareholder's equity pledge will lead to a decrease in the total factor productivity of the enterprise; Hypothesis 2, the higher the proportion of controlling shareholder's equity pledge, the more obvious the decline in total factor productivity.

3. RESEARCH DESIGN

3.1. Sample Selection and Data Sources

In this paper, A-share listed companies in China's capital markets from 2011 to 2020 are used as the research sample. In order to ensure the robustness and validity of the empirical results, this paper excludes: (1) samples from the financial industry; (2) Samples with missing data; (3) Companies that have been listed for less than one year; (4) Companies with financial risks such as ST, *ST, and PT. Finally, 23591 valid observations were obtained. In order to avoid the influence of extreme outliers, the Winsorize tail processing of up and down 1% is adopted for continuous variables. In terms of data sources, the controlling shareholder's equity pledge data comes from the Wind database, and other data comes from the CSMAR database. STATA15.0 was used for data processing.

3.2. Model Construction and Variable Design

In order to test the impact of Hypothesis 1 and Hypothesis 2 on the impact of controlling shareholder equity pledge on total factor productivity, this paper refers to the research of Zhang Ruijun(2018), Xie Deren(2016), and Chen Xi(2020), and constructs the following model:

$$Tfp_{i,t} = \alpha_0 + \alpha_1 Pldg_{i,t} + \alpha_2 Board_{i,t} + \alpha_3 Indr_{i,t} + \alpha_4 Dual_{i,t} + \alpha_5 Size_{i,t} + \alpha_6 Roa_{i,t} + \alpha_7 Lev_{i,t} + \alpha_8 Age_{i,t} + \alpha_9 Soe_{i,t} + \sum Year + \sum Industry + \varepsilon_{i,t} \quad (1)$$

$$Tfp_{i,t} = \beta_0 + \beta_1 PldgRt_{i,t} + \beta_2 Controls_{i,t} + \beta_3 Indr_{i,t} + \beta_4 Dual_{i,t} + \beta_5 Size_{i,t} + \beta_6 Roa_{i,t} + \beta_7 Lev_{i,t} + \beta_8 Age_{i,t} + \beta_9 Soe_{i,t} + \sum Year + \sum Indusrty + \varepsilon_{i,t} \quad (2)$$

The detailed definitions of each research variable in models (1) and (2) are as follows.

3.2.1. Explained Variable

Total Factor Productivity. At present, scholars mainly use OLS method, the OP^[5] method and the LP^[6] method to measure TFP. Due to the endogenous problem of the OLS method, the TFP estimation is not accurate enough. This paper refers to the studies of Lu Xiaodong and Lian Yujun (2012)^[7], Wang Jie (2014)^[8], Yang Rudai (2015)^[9], etc., using the LP method to estimate the total factor productivity, and in the The OP method is used in the robustness analysis to estimate total factor productivity.

3.2.2. Explanatory variables

Equity Pledge. This paper draws on the research of

Table 1 Variable Definition Table

variable type	variable name	variable ymbol	variable definition
Explained variable	Total Factor Productivity	Tfp	Obtaining the total factor productivity of enterprises through OP and LP methods
	Equity Pledge	Pldg	Whether the controlling shareholder has pledged equity, it is 1, otherwise it is 0
Explanatory variables	Equity pledge ratio	PldgRt	pledged shares / total share capital
	Board size	Board	Total number of board members
Control variables	Proportion of independent directors	Indr	Number of Independent Directors/Total Number of Board of Directors
	Dual Role of the Board Chairman	Dual	Whether the general manager and chairman of the board are concurrently held, is 1, otherwise it is 0
	Company size	Size	Natural logarithm of total assets
	Profitability	Roa	Net profit/Total assets
	Financial leverage	Lev	Total liabilities/Total assets
	Age	Age	log of time to market
	Nature of property rights	Soe	State-owned enterprises take the value 1, otherwise 0
	Industry	Industry	virtual variable
	Year	Year	virtual variable

Zhang Ruijun et al. (2017)^[10], and adopts a combination of dummy variables (Pldg) and continuous variables (PldgRt). When the controlling shareholder has equity pledge at the end of the period, the Pldg value is 1, otherwise it is 0. PldgRt is the ratio of the number of shares pledged by the controlling shareholder to the total share capital.

3.2.3. Control Variables

Referring to previous studies (Sheng Mingquan et al., 2019)^[12], this paper selects the following variables that affect the total factor productivity of enterprises in each regression model to control, including: Board size, Proportion of independent directors, Dual Role of the Board Chairman, Company size, Profitability, Financial leverage, Nature of property rights, Age, industry dummy variables, and annual dummy variables.

The detailed definition of each variable is shown in Table 1.

4. EMPIRICAL ANALYSIS

4.1. Descriptive Statistics

Table 2 Descriptive statistical analysis results of variables

Var.	N	mean	p50	sd	min	max
Tfp	23591	8.520	8.415	1.025	6.389	11.26
Pldg	23591	0.457	0.000	0.498	0.000	1.000
PldgRt	23591	0.080	0.000	0.114	0.000	0.436
Board	23591	8.565	9.000	1.674	5.000	15.00
Indr	23591	0.375	0.357	0.053	0.308	0.571

Dual	23591	0.273	0.000	0.445	0.000	1.000
Size	23591	22.21	22.03	1.272	19.88	26.12
Roa	23591	0.037	0.036	0.059	-0.229	0.195
Lev	23591	0.424	0.417	0.204	0.056	0.883
Age	23591	1.958	2.079	0.931	0.000	3.219
Soe	23591	0.364	0.000	0.481	0.000	1.000

Among the control variables, the range and standard deviation of the company size (Size) and the number of board members (Age) are relatively large, indicating that the sample covers listed companies of different sizes and ages, and is more representative. The mean and median of the asset-liability ratio (Lev) are 42.4% and 41.7% respectively, which shows that the overall debt level is relatively reasonable; the maximum value is 88.3%, and

the minimum value is 5.6%. The return on total assets (Roa) has a maximum value of 19.5% and a minimum value of -22.9%, indicating that the sample includes not only well-run companies, but also poorly-run companies. The average value of the independent director ratio (Indr) is 0.375, indicating that on average, 37.5% of the directors on the board of directors of each company are independent directors, which meets the minimum 1/3 ratio of independent directors on the board of directors of the CSRC. The average value of Indr is 0.375, indicating that the proportion of chairman and general manager held by the same person is close to 40%, and the phenomenon of two-in-one is relatively common.

4.2. Correlation Analysis

In this paper, STATA15.0 was used to analyze the correlation of main research variables, and the results are shown in Table 3.

The results show that the two proxy indicators of controlling shareholder's equity pledge, the controlling

shareholder's equity pledge (Pldg) and the controlling shareholder's equity pledge ratio (PldgRt), are significantly negatively correlated with total factor productivity (Tfp) at the level of 1%. Shareholder equity pledge will reduce the total factor productivity of enterprises, and the higher the pledge ratio, the lower the total factor productivity, which preliminarily supports research hypothesis 1 and research hypothesis 2. Among the control variables, board size (Board), firm size (Size), financial leverage (Lev), profitability (Roa), firm age (Age), property rights (Soe), and total factor productivity (Tfp) are within 1%. There is a significant positive correlation at the level; the two-in-one (Dual) is significantly negatively correlated with total factor productivity (Tfp) at the 1% level, and the proportion of independent directors (Indr) is significantly negatively correlated with total factor productivity (Tfp) at the 10% level. In addition, the absolute value of the correlation coefficient of most variables is less than 0.6, indicating that there is no serious multicollinearity problem.

Table 3 Correlation analysis of main variables

	Tfp	Pldg	PldgRt	Size	Roa	Lev	Age	Soe
Tfp	1							
Pldg	-0.082***	1						
PldgRt	-0.048***	0.758***	1					
Size	0.808***	-0.077***	-0.037***	1				
Roa	0.097***	-0.062***	-0.091***	-0.004	1			
Lev	0.497***	0.021***	0.086***	0.523***	-0.355***	1		
Age	0.318***	-0.062***	-0.014**	0.407***	-0.193***	0.372***	1	
Soe	0.275***	-0.427***	-0.362***	0.356***	-0.098***	0.300***	0.444***	1

Note: "****", "***", and "**" represent significant correlations at 1%, 5%, and 10% confidence levels (two-sided), respectively, as below.

4.3. Regression Analysis

Table 4 Equity pledge and TFP

VARIABLES	(1)	(2)
	Tfp	Tfp
Pldg	-0.071*** (-8.98)	
PldgRt		-0.282*** (-8.10)
Dual	-0.031*** (-3.96)	-0.032*** (-4.08)
Board	-0.015*** (-5.46)	-0.015*** (-5.54)
Indr	-0.252*** (-3.29)	-0.256*** (-3.35)
Size	0.601*** (154.00)	0.601*** (154.15)
Roa	2.724*** (33.48)	2.716*** (33.35)

Lev	0.867*** (32.48)	0.867*** (32.52)
Age	-0.009** (-1.97)	-0.009* (-1.92)
Soe	-0.007 (-0.74)	-0.003 (-0.30)
Constant	-5.184*** (-59.33)	-5.192*** (-59.49)
Year/Industry	Control	Control
N	23,591	23,591
Adj. R ²	0.737	0.737

In order to verify H1 and H2, we used Stata15.0 for multiple linear regression on the model 1 and model 2 respectively, and the results are shown in the columns (1) and (2) of Table 4.

It can be seen from Table 4 that the adjusted R2 of model 1 and model 2 are both greater than 0.3. It shows that the fitting effect of the two models is ideal, and the model establishment is reasonable. In Model 1, the regression coefficient of controlling shareholder equity pledge (Pldg) and total factor productivity (Tfp) is -

0.071, It is significantly negative at the 1% level, indicating that the controlling shareholder's equity pledge will lead to a decline in the total factor productivity of the enterprise, research H1 is supported. In Model 2, the regression coefficient between controlling shareholder equity pledge (PldgRt) and total factor productivity (Tfp) is -0.282, which is significantly negative at the 1% level. It shows that the higher the equity pledge ratio of controlling shareholders, the more obvious the decline of total factor productivity, and the research H2 is supported.

After the controlling shareholder's equity is pledged, the degree of separation of the two rights is aggravated, and it is easy to cause agency cost problems with other shareholders, this provides conditions for the controlling shareholder to encroach on the interests of other shareholders, and the agency cost increases, resulting in a decline in the production and operation efficiency of the enterprise. At the same time, equity pledge aggravates the risk of transfer of control rights. The controlling shareholder does not aim to increase the value of the enterprise, instead, short-term market value management through real earnings management and other behaviors disrupts the company's original strategic planning, affects the company's normal business activities and innovation activities, and leads to a decline in total factor productivity, which is not conducive to the company's long-term development.

4.4. Robustness Check

In order to test whether the empirical analysis results are robust, this paper adopts the method of replacing variables. The OP method was used to re-estimate the explanatory variable total factor productivity in the regression model, and regression analysis was carried out to verify whether the conclusions were consistent. As shown in the results, the regression results did not change substantially when the variables were replaced. This indicated that the regression results were robust. Due to space limitations, this table is not shown here. Please contact the author if you need it.

5. CONCLUSION

This paper takes my country's A-share listed companies from 2011 to 2020 as a sample to empirically test the relationship between controlling shareholder equity pledge and total factor productivity. It extends existing research. The study found that the controlling shareholder's equity pledge was significantly negatively correlated with total factor productivity. The higher the equity pledge of the controlling shareholder, the easier it is to encroach on the interests of the listed company or other shareholders, and ultimately reduce the total factor productivity of the enterprise.

Based on the above research results, this paper puts forward the following three suggestions: First, companies

should regulate the behavior of the controlling shareholders of listed companies. As one of the important financing channels for controlling shareholders, equity pledge is not only the personal behavior of the controlling shareholder, but also has a certain impact on the behavior of the companies. Regulating the behavior of controlling shareholders can effectively avoid the negative impact of their personal behavior. Secondly, enterprises need to expand financing channels and solve the current situation of financing difficulties. The problem of financing difficulty and expensive financing commonly existing in Chinese enterprises is one of the important reasons for the rapid development of equity pledge business. Only by continuously broadening financing channels and reducing the reliance of enterprises on equity pledge can the financing problems of enterprises be solved from the root. Thirdly, enterprises should improve the internal control system of enterprises. Enterprises should maintain their independence and improve the internal control system of the enterprise so as to avoid the behavior of the controlling shareholder that damages the enterprise or shareholders, reduce agency costs, improve enterprise operational efficiency, and improve enterprise total factor productivity.

ACKNOWLEDGMENTS

2020 Anhui Province Teaching Demonstration Course "Internal Audit"

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