Research on the Impact of Mixed Ownership Reform on the Investment Efficiency of Enterprises

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Abstract. The mixed ownership reform of State-owned enterprises(SOEs) introducing non-public capital has important theoretical and practical significance in promoting enterprise development. This paper takes 246 SOEs in China's A-share market as the research sample, based on data from 2011-2020, and applies paired-sample t-tests to study the changes in investment efficiency before and after the mixed reform, and constructs a panel regression model to empirically analyze the relationship between the mixed reform and the investment efficiency, as well as the differential impact of the holding mode and the degree of equity checks and balances of the mixed reformed enterprises on the investment efficiency. The results show that (1) mixed ownership reform of SOEs can improve investment efficiency. (2) The improvement effect of mixed reform on investment efficiency is optimal when the enterprise's holding mode is changed from absolute to relative after mixed reform. (3) The degree of equity checks and balances of enterprises under mixed reform will positively affect their investment efficiency.

Keywords: Mixed ownership reform; Investment efficiency; Holding mode; Equity checks and balances

1 Introduction

Mixed ownership reform means the introduction of non-public capital into state-owned capital and the development of an ownership structure in which several types of ownership economies operate in a mixed manner according to a set of rules. China introduced mixed ownership reforms in the 20th century in the hope that it would improve operational efficiency and promote investment. However, in the actual implementation of mixed ownership reform, does the efficiency of investment increase or decrease? On this issue, the research results of domestic and foreign scholars remain divergent. Therefore, this paper will study the impact of mixed ownership reform on enterprise investment efficiency, and make an entry from two perspectives, namely holding mode and equity checks and balances degree, to analyze whether there is any difference in the impact of mixed reform mode on enterprise investment efficiency. It is hoped that the research in this paper can provide policy suggestions for promoting the reform of SOEs and improving investment efficiency.

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2 Literature reviews

There are many academic studies on the issue of mixed ownership reform. Huang Sujian (2014) and other scholars defined the mixed ownership reform as the introduction of non-public capital into state-owned capital and the promotion of diversification of investment subjects, so as to form a situation of cross-shareholding and mutual integration of state-owned capital, collective capital, non-public capital, etc. at the level of the enterprise[1]. The way of mixed reform is also divided into a variety of ways, and the research of scholars mostly focuses on transforming the holding mode, adjusting the degree of equity checks and balances (Li Chunling,2017[2]), and so on. The reason why the state vigorously promotes mixed reform is that mixed reform can coordinate the relationship between different interests, guide the healthy development of the non-public economy, and promote the formation of appropriate checks and balances structure of enterprises, which improves the investment efficiency of SOEs.

Investment efficiency is the ratio of outputs to inputs of the investment made by an enterprise and determines the development direction of the enterprise. Most scholars use the residual model[3] proposed by Richardson (2006) to measure investment efficiency, while some scholars use data envelopment analysis (DEA) to measure investment efficiency (Chen Gongrong,2011[4]).

The current academic research on the impact of mixed reform on enterprise investment efficiency is still divided. Most scholars believe that mixed reform has a promoting effect on the investment efficiency of enterprises. Xu Chenxi (2020) considered the mechanism and path of mixed reform on the investment efficiency of enterprises from the perspectives of overinvestment and underinvestment respectively, and concluded that the mixed ownership reform can promote SOEs to improve their investment efficiency over underinvestment[5]. A few scholars believe that mixed reform has no obvious effect on the investment efficiency of enterprises (Jie Gan,2017[6]), and even reduces the investment efficiency (Xin Jin,2016[7]).

To summarize, the purpose of the government to promote mixed reform is to improve profitability as well as investment efficiency. However, scholars have come to different conclusions about the actual effect of administrative means and the impact of mixed reform on investment efficiency due to the inconsistency of research objects and directions, so the goal of determining the actual mechanism of mixed reform on investment efficiency and how to adopt appropriate reforms in order to improve the level of investment efficiency needs to be reached urgently.

3 Research hypothesis

The principal-agent theory asserts that the interests of the owner and the operator of an enterprise do not coincide, and the information asymmetry theory suggests that in market economic activities, there are differences in the understanding of relevant information among various categories of people. Therefore, enterprises controlled by state-owned capital will have the negative effects of “one share dominance” and “insider control”, which leads to the phenomenon of over-investment and inefficient investment. A large number of research results show that the level of corporate investment efficiency can be improved through corporate equity reform and the selection of appropriate holding modes and shareholders’ shareholding ratios.

Megginson (2004) argues that private property rights operate more efficiently than state-owned property rights because Pareto-style competitive equilibrium is effective[8], Therefore, this paper argues that mixed reform can improve the holding mode of enterprises and reduce the inefficient investment, thus proposing hypothesis 1.

Hypothesis 1: Mixed ownership reform can lead to the improvement of investment efficiency of SOEs.

The holding modes of SOEs undergoing mixed reform include absolute holding and relative holding. Most scholars believe that the investment efficiency of enterprises is higher when SOEs are in the relative holding mode (Zhou Zheng,2021[9]), Therefore, this paper proposes hypothesis 2.

Hypothesis 2: There is a difference in the impact of SOEs' holding methods on the investment efficiency of enterprises under the mixed reform.

Scholars have also conducted research on whether the degree of equity checks and balances plays a role in investment efficiency. Berkman (2010) has shown that SOEs with a higher degree of equity checks and balances can improve the level of internal balances, and effectively reduce the level of inefficient investment in the enterprise[10], Therefore, this paper proposes hypothesis 3.

Hypothesis 3: The higher the degree of equity checks and balances in SOEs undergoing mixed reform, the higher the investment efficiency.

4 Empirical analysis and results

4.1 Variables Explanation

The definitions and descriptions of each variable are shown in Table 1.

Table 1. Variable definitions and descriptions

Type of variable	Indicators of variable	Description of variable	Variable symbol	Expected direction
Explained variable	Inefficient investment	Investments not maximizing shareholder value	Abinv	
Explanatory variable	Dummy variables for mixed reform	Assigned a value of 1 if the SOE carries out mixed reforms, otherwise 0	After	−
	Holding mode variable	Changing from absolute to relative holding mode after mixed reform, assigns a value of 1, otherwise 0	Change1	−
		Keeping the absolute holding mode after mixed reform, assigns a value of 1, otherwise 0	Change2	−
		Keeping the relative holding mode after mixed reform, assigns a value of 1, otherwise 0	Change3	+
	Degree of equity checks and balances	Sum of shareholding ratios of the second to tenth largest shareholders	Bal	−

		/Shareholding ratio of the largest shareholder		
	Shareholding ratio of the largest shareholder	Number of shares held by the largest shareholder at the end of the year /Total shares of the company	Fcon	+
Control variable	Asset-liability ratio	Total liabilities of the company at the end of the year /Total assets at the end of the year	Lev	−
	Company size	Natural logarithm of total assets of the company at the end of the year	Size	−
	Cash holdings	Total monetary funds at the end of the year /Total assets at the end of the year	Cash	−
	Total asset growth rate	Increase in total assets for the year /Total assets at the end of the previous year	Grow	+
	Annual dummy variables	Take 2015 as an example, if it is 2015, the value is 1, otherwise it is 0	Year	

4.2 Sample Selection and Data Sources

This paper takes the SOEs absorbing non-public capital for mixed reform as a sample, and selects 2012-2019 as the time range of the research data, taking the first 2 years as the pre-mixed reform and the last 2 years as the post-mixed reform. In addition, the change of shareholding ratio and shareholders in the year of mixed reform will lead to the instability of the company's status, therefore, the time range of the data used in this paper is 2011-2020, and the data of the current period of mixed reform will not be studied.

The sample data comes from the database of CSMAR. In order to prevent the data of ST, *ST companies, companies with unusual data from adversely affecting the results of the study, this paper screens and excludes this kind of data, and ultimately identifies 246 sample companies.

4.3 Econometric model

(1) Model for measuring investment efficiency

Drawing on Li Chunling (2017[2]), this paper constructs Model 1 and uses the regression residuals to calculate the inefficient investment. The residual tends to 0 means the lower the value of inefficient investment, and thus the higher the efficiency of investment; a positive and larger residual means the higher the value of inefficient investment, which means the lower the efficiency of investment, in a state of overinvestment; a negative and smaller residual means the higher the level of inefficient investment, the lower the efficiency of investment, in a state of underinvestment.

$$Inv_{i,t} = \beta_0 + \beta_1 Grow_{i,t-1} + \beta_2 Flow_{i,t-1} + \beta_3 Lev_{i,t-1} + \beta_4 Age_{i,t-1} + \beta_5 AR_{i,t-1} + \beta_6 Inv_{i,t-1} + \sum Year + \varepsilon$$

$$i = 1, \dots, 246 \; ; \; t = 1,2, \dots, 8 \qquad (1)$$

In the model, $Inv_{i,t}$ denotes the net investment expenditure in year t; $Inv_{i,t-1}$ denotes the net investment expenditure in year t-1, which is expressed by the cash expenditure for purchasing

assets at the end of the period/total assets at the beginning of the year; Grow denotes the development ability of the company, which is expressed by the growth rate of total assets in this paper; Flow denotes the cash flow, which is expressed by the net cash flow generated from operation/total assets at the beginning of the year; Lev is the gearing ratio; Age is the age of listed company; AR is the earnings per share; Year is the year control variable and the dummy variable, take year t as an example, if the year is t, take the value of 1, otherwise 0.

(2) Model of the Relationship between Mixed Reform and Investment Efficiency

To verify whether hypotheses 1,2,3 of this paper are valid, model 2 is constructed as follows.

$$Abinv_{i,t} = \beta_0 + \beta_1 After_{i,t} + \beta_2 Change_{i,t} + \beta_3 (After \times Bal)_{i,t} + \beta_4 Bal_{i,t} + \beta_5 Fcon_{i,t} + \beta_6 Lev_{i,t} + \beta_7 Size_{i,t} + \beta_8 Cash_{i,t} + \beta_9 Grow_{i,t} + \sum Year + \varepsilon$$

$$i=1, \dots, 246 \ ; \ t=1,2, \dots, 8 \qquad (2)$$

In the model, Abinv is the explanatory variable, which is the absolute value of the residuals from the regression results of model 1, and is used as a measure of investment efficiency, with larger values indicating lower investment efficiency. After is a dummy variable for the mixed reform, with the year before the mixed reform assigned a value of 0, and the year after assigned a value of 1. If the coefficient β_1 of this variable is significantly negative, Hypothesis 1 can be verified. Change is a Variable reflecting the holding mode of the mixed ownership reform. The model sets three indicators Change1, Change2 and Change3 according to the change of holding mode, which are entered into the model sequentially in the regression, and the hypothesis 2 is tested by observing the impact of the change of different holding modes on the inefficient investment after the mixing reform. After × Bal is the cross variable between the mixed reform and the degree of equity checks and balances, and if the coefficient of the variable β_3 is negative and significant, then the hypothesis 3 can be verified.

4.4 Panel data regression results

(1) Descriptive statistical analysis

It can be seen from Table 2 that the minimum value of inefficient investment in the sample enterprises is close to 0, the maximum value is close to 1, and the mean value is 0.032, with little difference in distribution; the average value of equity checks and balances is 0.4873, with a lower level; the maximum value of the proportion of the first largest shareholder's shareholding is 83.74%, and the mean value is 43.33%, which indicates that quite a number of SOEs still maintain a more centralized situation in their equity structure.

Table 2. Descriptive statistics of the main variables of the sample

	Mean	Maximum	Minimum	Std.Dev	Sample size
Abinv	0.032	0.9807	0.0001	0.0421	1230
Bal	0.4873	2.65	0.01	0.4868	1230
Fcon	0.4333	0.8374	0.1118	0.1353	1230

(2) Paired-sample T-test

This paper uses paired-sample T-test to study the changes in investment efficiency before and after the mixed reform; The changes in investment efficiency of enterprises with different holding

modes and different equity checks and balances before and after mixed reform, respectively. The test results conclude that:

The inefficient investment is 0.0389 before the mixed reform and 0.0323 after the mixed reform, the difference is 0.0066 and significant at 1% level, and the investment efficiency is improved by 16.97%. This shows that there is a significant decrease in inefficient investment after the mixed reform, and the mixed reform has played a positive role in investment efficiency.

The inefficient investment of enterprises whose holding mode is changed from absolute to relative is 0.0386 before the mixed reform, and 0.272 after it, which is a significant improvement of investment efficiency by 29.53%. nevertheless, the investment efficiency of enterprises that keep the absolute or relative holding mode unchanged before and after the mixed reform increased by 21.52% and -16.23% respectively, which is significantly lower than the enterprises whose holding mode is changed from absolute to relative.

The investment efficiency of firms with a low level of equity checks and balances (<0.5) increases by 15.28%, those with a medium level (>=0.5 and <1) increase by 20.29%, and those with a high level (>=1) significantly increase by 25.29%. This suggests that increasing the degree of equity checks and balances can effectively contribute to the improvement of corporate investment efficiency.

(3) Panel regression analysis

The regression results of the impact of holding mode and equity balance on investment efficiency are shown in Table 3. The data in column 1 are the regression results after adding only the Dummy variables for mixed reform, and the data in columns 2, 3, and 4 are the regression results after adding the holding mode variable, and the cross variable between the mixed reform and the degree of equity checks and balances, respectively.

First of all, from Table 3, we can find that in the results of the four panel regressions, the coefficients of After are -0.0138, -0.0135, -0.0126, -0.0133, whose values are negative and all of them pass the test of the significance level of 1%, which suggests that Hypothesis 1 passes the test, that is, the efficiency of the SOEs' investment after the mixed reform has been significantly improved.

Secondly, the results of the second and third columns of the regression involving variable Change1 and variable Change2 show that the estimated coefficients of both Change1 and Change2 are negative. However, the estimated coefficient of variable Change2 is -0.004, while the estimated coefficient of Change1 is -0.03 and significant at the 5% level, which indicates that compared with the enterprises keeping absolute holding unchanged, the investment efficiency is significantly improved when the enterprises change from absolute holding to relative holding after the mixed reform. In the fourth column of the regression results corresponding to Change3, the estimated coefficient of this variable is 0.006 and passes the 10% significance level test. Therefore, we can believe that under the mixed reform, the enterprises keep the relative holding mode unchanged will reduce the investment efficiency of the enterprises. Therefore, the regression results can prove that hypothesis 2 passes the test, there is a difference in the impact of the SOEs' holding mode on the enterprise investment efficiency after the mixed reform, and the investment efficiency improvement is optimal when the holding mode is changed from absolute holding to relative holding under the mixed reform.

Finally, Table 3 shows the estimated coefficients of the degree of equity checks and balances, After*Bal. The value of the estimated coefficient of the degree of equity checks and balances in the first column of the regression results is -0.006 and significant, and the estimated coefficients of the crossover variables of After*Bal are -0.0267, -0.0234, and -0.0213, respectively, whose values are all negative and significant at the 5% level. It means that hypothesis 3 passes the test, it indicates that the higher the degree of equity checks and balances in SOEs undergoing mixed reform, the higher the investment efficiency.

Table 3. Regression results of panel data model

Name	(1)	(2)	(3)	(4)
Constant	0.065***	0.064***	0.069***	0.057**
	(2.80)	(2.72)	(2.89)	(2.37)
After	-0.0138***	-0.0135***	-0.0126***	-0.0133***
	(-1.38)	(-1.34)	(-1.09)	(-1.32)
Change1	——	-0.03**	——	——
	——	(-1.83)	——	——
Change2	——	——	-0.004	——
	——	——	(-0.86)	——
Change3	——	——	——	0.006*
	——	——	——	(1.84)
After×Bal	——	-0.0267**	-0.0234**	-0.0213**
	——	(-1.83)	(-1.21)	(-1.10)
Bal	-0.006***	0.004	0.005	0.003
	(-1.94)	(0.63)	(0.78)	(0.48)
Fcon	0.000034	0.00004	-0.000035	0.00013
	(0.24)	(0.29)	(-0.21)	(0.83)
Lev	-0.00034***	-0.000337***	-0.00034***	-0.000339***
	(-4.07)	(-4.02)	(-3.99)	(-4.05)
Size	-0.000	-0.000	-0.00037	-0.000
	(-0.30)	(-0.24)	(-0.31)	(-0.17)
Cash	-0.001***	-0.001***	-0.001***	-0.001***
	(-4.12)	(-4.13)	(-4.13)	(-4.15)
Grow	0.000374***	0.000375***	0.000374***	0.000***
	(15.09)	(15.09)	(15.09)	(15.11)
Year	——	control		——
Adj.R-square	0.1866	0.1864	0.1878	0.1875
F-value	260.09***	260.51***	260.72***	263.71***

5 Conclusion and suggestion

This paper takes 246 state-owned enterprises in China's A-shares as research samples. Based on the data from 2011 to 2020, this paper uses paired sample T-test to study the changes in investment efficiency before and after the mixed reform, and constructs a panel regression model to empirically analyze the relationship between the mixed reform and investment efficiency. It has important theoretical and practical significance for the mixed ownership reform of state-owned enterprises to introduce non-public capital to promote the development of enterprises.

Based on these conclusions, this paper makes the following recommendations:

(1) Relaxing access conditions for non-public capital and actively developing mixed ownership. policies should be further refined and relaxed in all respects to allow private capital to enter industries and fields such as infrastructure and public utilities, which are not subject to legal restrictions; non-public enterprises should be encouraged to participate in the reform of SOEs; and mixed-ownership reform of SOEs should be actively promoted.

(2) Setting the holding mode in SOEs appropriately. In the mixed reform, it is necessary to choose the holding mode according to the specific situation and characteristics of the industry, so as to optimize the efficiency of the investment.

(3) Enhancing the voice of non-public capital and promoting higher equity checks and balances. In the mixed reform, attention should be paid to the reasonable adjustment of the shareholding structure to enhance the voice of non-public capital, so as to effectively improve the degree of equity checks and balances, and promote the enhancement of enterprise investment efficiency.

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