Local Government Debt and Corporate Innovation

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ABSTRACT: *Based on the data of Chinese A-share listed companies from 2012 to 2020, this paper uses Hansen threshold model to study the relationship between local government debt and innovation on the premise of considering the difference of infrastructure investment. The results show that the impact of local debt on enterprise innovation is nonlinear because of the difference of infrastructure investment intensity. Specifically, when the intensity of infrastructure investment is low, local debt has a significant inhibitory effect on enterprise innovation.*
KEY WORD: *Local government debt, Corporate Innovation, Infrastructure Investment, Threshold Model*

I. INTRODUCTION AND LITERATURE REVIEW

In recent years, local government debt and innovation strategies have attracted much attention. Local government debt will have an impact on financial resources, which in turn will have an impact on the investment of enterprises in innovation activities. Therefore, there is a certain correlation between local debt and enterprise innovation. This paper uses the balance panel data of Chinese A-share listed companies from 2012 to 2020 to study the relationship between local debt and enterprise innovation on the premise of considering the investment intensity of infrastructure. The contributions of this paper are as follows: First, it focuses on the macro environment and studies its influence on the micro activities of enterprises, expanding the research scope of transmission mechanism from macro to micro. Second, it focuses on the impact of infrastructure investment intensity on enterprise innovation. Thirdly, this paper studies the relationship between local debt and enterprise innovation from a nonlinear perspective, which enriches relevant literature to some extent.

II. LITERATURE REVIEW

2.1 The economic consequences of local government debt

At present, scholars believe that the increase of local debt is mainly due to investment in infrastructure construction, which can promote regional economic growth (Hildreth and Zorn, 2010). However overinvestment can actually depress economic growth. In addition, local debt will also compete with enterprises for financing resources.

2.2 The influencing factors of enterprise innovation

Innovation can enable enterprises to be competitive in the industry and develop better, which is a key link in economic and social development. A series of studies at home and abroad show that the innovation ability of enterprises is affected by macro external factors such as financing constraints, infrastructure construction and fiscal policies (Limao and Venables,2001).

III. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

3.1 Local Debt and Enterprise Innovation

The source, scale and direction of local debt will affect the allocation of financial resources in the financial market, and the increase of local debt will reduce the allocation efficiency of financial resources, thus hindering enterprises' R&D activities. Firstly, local government borrowing will form a competitive relationship with enterprises, which will increase the financing difficulty of enterprises, and then generate crowding out effect on enterprises' innovation activities (Hall and Lerner,2010). Secondly, the repayment pressure of local government will have an impact on their future fiscal expenditure, which in turn will affect enterprise innovation (Greiner,2013). Therefore, the increase of local government debt increases the financing difficulty of enterprises, thus increasing the innovation cost of enterprises and discouraging their innovation enthusiasm. This paper proposes a hypothesis:

H1: Other conditions remain unchanged, local debt is negatively correlated with enterprise innovation.

3.2 The impact of infrastructure investment intensity

Infrastructure in less developed areas still needs to be improved, so government borrowing to invest can also bring positive externalities, which can offset the crowding out effect of local debt, and finally promote innovation activities. However, the infrastructure in developed areas has been relatively complete (Demetriades and Mamuneas,2000). At this time, government continue to expand debt to invest in infrastructure, which will intensify the crowding out effect, and ultimately hinder enterprise innovation. To this end, this paper proposes a hypothesis:

H2: When other conditions remain unchanged and the intensity of infrastructure investment is lower than a certain level, local debt is negatively correlated with enterprise innovation.

IV.   VARIABLE DESIGN AND DATA DESCRIPTION

4.1 Sample selection and data source selection

This paper takes the balance panel data of Chinese A-share listed companies from 2012 to 2020 as samples. The data is from CSMAR、WIND and RESSET.

4.2 The empirical model

Based on Hansen's research results (Hansen,1999), this paper designs a threshold model.

$$RD_{It} = \alpha + \beta_1 LGD_{It} \cdot I(INV_{it} \leq \gamma) + \beta_2 LGD_{It} \cdot I(INV_{it} > \gamma) + \beta_3 X_{it} + \epsilon_t$$

Where,

$RD_{it} = R\&D\ investment\ 2013 - 2019$

$LGD_{it} = The\ ratio\ of\ the\ balance\ of\ local\ debt\ to\ regional\ GDP\ over\ 2013 - 2019$

$INV_{it} = The\ intensity\ of\ infrastructure\ investment\ over\ 2013 - 2019$

$X_{it} = The\ shareholding\ ratio\ of\ the\ largest\ shareholder, Tobin's\ Q, enterprise\ size, Roa, cash\ flow$
$\quad\quad ratio, intangible\ assets\ ratio, Lev\ and\ enterprise\ age\ over\ 2013 - 2019$

$\beta_1 - \beta_3 = Coeffeicents\ for\ the\ respective\ variables.$

$\epsilon_t = Error\ term$

V.   EMPIRICAL ANALYSIS

5.1 Descriptive statistical analysis

Table 1 shows descriptive statistical results. From the average, minimum value and maximum value of each variable, the scale of local debt and infrastructure investment intensity of different provinces differ greatly, and the R&D investment gap between companies is also large. The remaining variables are at normal levels.

Table 1: Descriptive Statistics

Variable	N	mean	sd	min	median	max
RD	9390	17.81	1.377	14.05	17.79	21.53
LGD	9390	0.181	0.067	0.095	0.164	0.385
INV	9390	0.076	0.041	0.027	0.060	0.253
Int	9390	0.048	0.042	0.001	0.037	0.252
Lev	9390	0.402	0.200	0.046	0.392	0.864
Q	9390	2.699	1.734	0.925	2.162	10.15
ROA	9390	0.043	0.052	-0.139	0.038	0.204
Cf	9390	-0.026	0.096	-0.324	-0.017	0.216
Lash	9390	0.340	0.142	0.090	0.321	0.716
Size	9390	22.10	1.200	19.97	21.92	25.88
Age	9390	2.846	0.280	2.079	2.833	3.497

5.2 Correlation analysis

According to the correlation analysis, LGD and RD are significantly negatively correlated, indicating that the larger the local debt scale is, the lower the enterprise R&D investment will be. In addition, INV, Int, and Q were significantly negatively correlated with RD. Lev, ROA, Cf, Lash, Size and Age were significantly positively correlated with RD.

5.3 Threshold effect analysis

First, the significance of threshold effect is tested, then the number of thresholds and the specific model are determined. Table 2 reports the results of significance test when INV is used as threshold variable. It can be seen from Table 2 that single and double thresholds have significant effects, while triple thresholds do not. Therefore, double thresholds will be used for the next test.

Table 2: Threshold Effect Test

Threshold	F	P	BS	1%	5%	10%
Single	27.174***	0.000	300	10.748	7.337	5.298
Double	11.569**	0.030	300	14.670	9.818	6.667
Triple	5.588	0.150	300	15.877	9.358	7.264

***, ** and * represent the significance level of 1%, 5% and 10%.

Table 3 shows the consistency test results for the threshold model, and shows two threshold estimates and confidence intervals. Figures 1 and 2 show the threshold estimate and confidence interval. In this paper, regional infrastructure investment intensity is divided into low intensity (INV≤0.091) and medium intensity (0.091<INV≤0.184) and high strength (INV<0.184).

Table 3: Threshold Estimate And 95% Confidence Interval

Threshold	The threshold value	95% confidence interval
First	0.091	[0.039, 0.115]
Second	0.184	[0.178, 0.210]

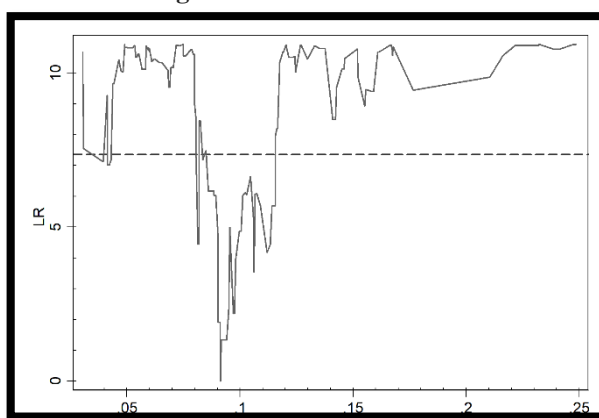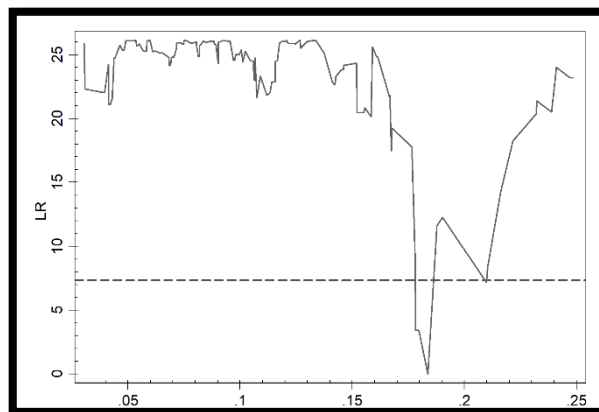**Figure 1: The first threshold**

Figure 2: The second threshold

According to the statistics of INV in each year, it can be seen that the low intensity range is dominated by the eastern provinces. The provinces in the medium intensity range are mainly in the central and western regions. The high intensity range is all in the western regions. Therefore, it can be found that the eastern region of China has a developed economy, so the infrastructure is relatively complete and INV is relatively low. The infrastructure in the central region is at a medium level and still needs to be improved. The western region is underdeveloped, and the infrastructure is relatively scarce, so it needs to be improved. Therefore, in recent years, it has begun to invest heavily.

Table 4 reports the analysis results of the double threshold model and also shows the regression results for fixed effects for comparison purposes. In the fixed effect model, LGD is significantly negatively correlated with RD, indicating that the increase of local debt will hinder enterprise innovation. Considering the threshold effect, it is found that the influence of local debt on R&D investment presents a complex nonlinear relationship.

According to the results in Table 4, LGD was negatively correlated with RD in areas with low INV intensity and moderate INV intensity. LGD was significantly positively correlated with RD in high intensity INV. Therefore, this paper accepts hypothesis 1 and hypothesis 2.

According to the above analysis, most of the low-intensity INV areas are developed in the East. The infrastructure in these areas is relatively complete, and at this time, most of the local debt funds are invested in non-economic public goods. Therefore, the effect of investment on improving the local economic environment is very weak, more of which is the crowding out effect. As a result, it is difficult for enterprises to finance, and finally give up high-cost and high-risk R&D activities and reduce R&D investment.

Most of the high-intensity INV areas are underdeveloped areas in the West. The infrastructure in these areas needs to be built and improved. Therefore, the government's investment in infrastructure construction plays a positive externality, which improves the local environment, promotes the flow of factor resources between regions, reduces enterprise costs, creates a good investment environment for enterprises to carry out innovation activities, thus increasing the R&D investment of enterprises.

Table 4: Estimation Results of Threshold Model

Variables	Double threshold	Fixed effects
LGD_ 1	-0.315***	
	(-3.02)	
LGD_ 2	-0.233*	
	(-1.71)	
LGD_ 3	0.749***	
	(4.66)	
LGD		-0.341***
		(-2.91)
Int	0.472**	0.517**
	(2.06)	(2.26)
Lev	-0.073	-0.082
	(-1.32)	(-1.48)
Q	0.004	0.003
	(1.09)	(0.88)
ROA	0.469***	0.454***
	(3.46)	(3.35)
Cf	0.153***	0.158***
	(2.88)	(2.97)
Lash	-0.288***	-0.257***
	(-3.09)	(-2.76)
Size	0.736***	0.736***
	(48.38)	(48.30)
Age	0.322***	0.411***
	(5.00)	(6.72)
Constant	0.785***	0.505*
	(2.93)	(1.93)
N	9390	9390
F	588.1	712.49
r2	0.453	0.4507
r2_w	0.453	0.4507

VI.   CONCLUSIONS AND IMPLICATIONS

6.1 The research conclusion

Based on the balance panel data of A-share listed companies from 2013 to 2019, this paper studies the relationship between local debt and enterprise innovation. The results are as follows. Firstly, on the whole, local government debt is negatively correlated with enterprise innovation. Secondly, considering the regional differences, there is a significant double threshold effect on the impact of local debt on enterprise innovation. It is found that when the intensity of infrastructure investment is high, local government debt can promote enterprise innovation.

6.2 Suggestions

First, policies should be tailored to local conditions: Local government debt is not absolutely harmful or beneficial, the key is whether the use of local debt is necessary and plays a positive role. This requires local governments to make active investigations, accurately understand the capital orientation of local debt, and give full play to the promoting effect of local debt on enterprise innovation.

Second, make a rational plan for regional development and formulate key areas in a scientific way: Local government debt is mainly used to invest in infrastructure, but we should avoid excessive investment and waste of resources.

Third, adjust the relationship between local government debt and enterprise innovation funds: According to the previous analysis, it can be seen that local debt financing is easy to seize the economic resources of enterprises, which has a strong crowding out effect on enterprise financing. Therefore, it is necessary to coordinate the financial resources of enterprises and local governments.

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