

2014

BioTechnology

An Indian Journal

FULL PAPER

BTAIJ, 10(12), 2014 [6650-6658]

The impact of financial constraint difference on capital accumulation of private enterprises in China——taking the industry enterprises as example

Sun Zhuo

School of Economics and Management, Tongji University, Shanghai, (CHINA)

ABSTRACT

In China, private enterprises have been facing with more serious finance constraint than state-owned enterprises since reform and opening up. This paper focuses on proving the private enterprises are more productive than state-owned ones in capital output efficiency by calculating two sectors capital returns. Then this paper estimates the impact of financial constraint difference on capital accumulation of private sector by using the data gathered from 2001 to 2011. The results show that: (1) private sector's capital return rate is higher than state-owned sector; (2) as financial constraint difference increases 1 unit, private firms' capital stock will be restricted 1.19 units. Finally, this paper gives some explanations and suggestions on the basis of above results.

KEYWORDS

Financial constraint; Private enterprises; State-owned enterprises; Capital accumulation.



INTRODUCTION

Problem raising

As the explosion of financial crisis in the past decades, many researchers paid close attention to the relationship of financial development and economic growth through theoretical and empirical analysis. Although some scholars^[1,2,3] suggested that we should not overemphasize the promotion of financial development to economic growth. But as the importance of financial intermediaries and financial market increases in economy, more and more scholars, such as King and Levine (1993), Levine (2005), Ang (2008) Valickova et al. (2013), began to attach great importance to financial sector and approved the positive role of finance development in economic growth.

Some papers started from the functions of financial development in understanding the causes and mechanism of economic growth. Merton and Bodie (1995), Levine (1997) suggested that one of key roles of financial sector is to promote the effective allocation of resources in both space and time. In other words, the financial intermediaries will distribute savings to more productive and profitable firms in real sector. Theoretically, the financial institutions play a very important role on distributing the funds to the enterprise which achieve higher marginal income ratio of capital. In China, private enterprises (PEs) are more fast-developing and dynamic than state-owned enterprises (SOEs). Actually, the financing channels and investment structure are obviously inclined to state-owned enterprises; there are two different kinds of financial arrangement for SOEs and PEs^[10]. SOEs have easier access to get loans from the financial institutions, especially state owned institutions. This kind of phenomenon is exactly consistent with the theory.

Under China's unique financial system, PEs are confronted with more serious financial constraint than SOEs. This kind of discriminate in allocating capital from banks is defined as financial constraint difference in this paper. It is particularly notorious that financial constraint affects investment scale and returns in firms. Fazzari et al. (1988) proposed financial constraint hypothesis according to the information asymmetry. Henceforth, a lot of research achievements are presented in this field, some scholars^[12,13] supported argument from Fazzari et al. (1988). In view of specific situation in China, Li et al. (2006), Wang et al. (2008), testified the impact of financial constraint on restricting investment and capital stock.

Although financial development and financial constraint have been hotspots in academic, it is not always observed, especially in macro-level, that researchers^[16] focus on the difference of financial constraint between SOEs and PEs. Meanwhile, under the specific financial system in China, PEs have been facing with more serious difficulties than SOEs in obtaining funds. And this problem gives rise to financial constraint difference and restricts PEs investment decision and cost for expanding production scale. So this paper will testify the differences in SOEs and PEs return on capital accumulation at the first step; then emphasize the effect of financing constraints for the macro-economy through quantifying the difference of financial constraint between SOEs and PEs.

Research ideas and structure

In order to solve the problems above, this paper includes four parts: Firstly, this paper will build two types of mathematical models. One model is to compare the different of marginal income ratio of capital between SOEs and PEs to make sure whether the financial institution behavior is reasonable in China. The other one is for estimating the degree to which the financial constraint difference affects PEs capital stock. Both of the models will be set as Cobb-Douglas production function. Secondly, we will search for variables and data for describing inputs factors and output effect on the basis of data validity. Moreover, we will find out a suitable index to reflect financial constraint, and analyze the impact of difference between SOEs and PEs of financial constraint on capital accumulation. Thirdly, econometric model will be built basing on above work for verifying the assumptions of this paper and reflecting China's unique phenomena in China's financial market. Fourthly, this paper will summarize the conclusions deriving from previous study and make several suggestions for mitigating PEs financing problems in China.

MODEL AND METHOD

Model I: comparison of SOEs and PEs in capital return

Basing on research object, this paper assumes that firstly, there are two sectors in economy including SOEs and PEs sectors; secondly, three inputs contribute to the economic outputs: SOEs and PEs capital accumulation and national labor input; thirdly, the production function satisfies with C-D form. So the production function that can estimate and compare the marginal output of SOEs and PEs capital could be established as follow:

$$Y_t = A \cdot K_{s,t}^\alpha \cdot K_{p,t}^\beta \cdot L_t^\gamma \quad (1)$$

where t denotes times subscripts; Y represents the output; A which denotes national level of technological progress is constant; K_s and K_p respectively present SOEs and PEs capital accumulation; L represents national employment; α , β and γ capture the output elasticity of K_s , K_p and L separately.

Secondly, we are interested in comparing SOEs and PEs marginal output of capital which could be derived from Equation (1):

$$\frac{\partial Y_t}{\partial K_{s,t}} = \alpha \cdot \frac{Y_t}{K_{s,t}} \quad (2)$$

$$\frac{\partial Y_t}{\partial K_{p,t}} = \beta \cdot \frac{Y_t}{K_{p,t}} \quad (3)$$

at the perfect competition system, the marginal output of capital reflects the rate of capital return, so that we can confirm the difference between SOEs and PEs capital efficiency by estimating the capital marginal output. And the difference of marginal output of K_s and K_p which can be confirmed through reducing Equation (2) by (3), and then we get Equation (4):

$$D = \frac{\partial Y}{\partial K_s} - \frac{\partial Y}{\partial K_p} = \alpha \cdot \frac{Y}{K_s} - \beta \cdot \frac{Y}{K_p} = \left(\alpha \cdot \frac{1}{K_s} - \beta \cdot \frac{1}{K_p} \right) \cdot Y \quad (4)$$

where D can reflect the difference in marginal output of capital between SOEs and PEs. In Equation (5), if $D \geq 0$, it means that the capital return of SOEs is equal or higher than PEs; conversely, $D < 0$ that figures that the capital return of PEs is higher.

Model II: the impact of difference in financial constraint on capital accumulation

After comparing the difference of capital return between SOEs and PEs, we can confirm whether PEs face with the differentiated treatment in the financing market. So it is exactly imperative to analyze the difference in financial constraint between SOEs and PEs, and even focus on the impact of this kind of difference on capital accumulation. This section continues to deduce how the financial constraint affects the capital accumulation in theory.

We assume that production function of SOEs and PEs are defined as follows:

$$Y_{s,t} = A_s \cdot K_{s,t}^{\alpha_s} \cdot L_{s,t}^{\beta_s} \quad (5)$$

$$Y_{p,t} = A_p \cdot K_{p,t}^{\alpha_p} \cdot L_{p,t}^{\beta_p} \tag{6}$$

then, take a derivative with respect to L on the both sides of Equation (5) and (6) and get the relationship between wages ω and marginal product of labor which can be calculated as (8) and (9):

$$\omega_{s,t} = \frac{\partial Y_{s,t}}{\partial L_{s,t}} = A_s \cdot \alpha_{s,t} \cdot L_{s,t}^{\alpha_s-1} \cdot K_{s,t}^{\beta_s} = \alpha_s \cdot \frac{Y_{s,t}}{L_{s,t}} \tag{7}$$

$$\omega_{p,t} = \frac{\partial Y_{p,t}}{\partial L_{p,t}} = A_p \cdot \alpha_p \cdot L_{p,t}^{\alpha_p-1} \cdot K_{p,t}^{\beta_p} = \alpha_p \cdot \frac{Y_{p,t}}{L_{p,t}} \tag{8}$$

and take a derivative with respect to K on the both sides of equations (7) and (8), we can obtain the relationship between capital rents r and marginal product of capital which can be shown in (9) and (10):

$$r_{s,t} = \frac{\partial Y_{s,t}}{\partial K_{s,t}} = A_s \cdot \beta_{s,t} \cdot L_{s,t}^{\alpha_s} \cdot K_{s,t}^{\beta_s-1} = \beta_s \cdot \frac{Y_{s,t}}{K_{s,t}} \tag{9}$$

$$r_{p,t} = \frac{\partial Y_{p,t}}{\partial K_{p,t}} = A_p \cdot \beta_p \cdot L_{p,t}^{\alpha_p} \cdot K_{p,t}^{\beta_p-1} = \beta_p \cdot \frac{Y_{p,t}}{K_{p,t}} \tag{10}$$

next, after dividing equation (7) and (8) by (9), (10) separately, we can get the formulas as follows:

$$\frac{\omega_s}{\gamma_s} = \frac{\alpha_s}{\beta_s} \cdot \frac{K_s}{L_s} = \frac{\alpha_s}{\beta_s} \cdot k_s \tag{11}$$

$$\frac{\omega_p}{\gamma_p} = \frac{\alpha_p}{\beta_p} \cdot \frac{K_p}{L_p} = \frac{\alpha_p}{\beta_p} \cdot k_p \tag{12}$$

where k which equals K_s/L_s is the capital stock per capita. Then k_p can be derived by dividing equations (11) by (12):

$$k_p = \frac{\alpha_s}{\beta_s} \cdot \frac{\beta_p}{\alpha_p} \cdot \frac{\omega_p}{\omega_s} \cdot \frac{r_p}{r_s} \cdot k_s \tag{13}$$

from Equation (14) we figure out that the PEs capital stock per capita is influenced by several factors: the elasticity coefficient of capital and labor; the wage ratio of SOEs to PEs; capital rent ratio of two sectors which can be defined as financial constraint difference; and SOEs capital stock per capita. Then we will identify the impact of financial constraint on PEs capital accumulation by analyzing the relationship between k_p and γ_p/γ_s .

VARIABLES AND DATA ILLUSTRATION

As China is in the process of rapid industrialization, we consider choosing the industrial enterprises as the sample to estimate the industrial production function. On the basis of the forgoing derivation, we need to collect data of input and output variables from the yearbook and database.

Output

In view of national economic accounting method, industrial add value (IAV) is the most appropriate indicator to be chosen as industrial output. However, the data of IAV is just offered in 2001 to 2003 and 2005 to 2007, so we have to look for an alternative indicator, the gross industrial output value (GIOV), as substitution variable. Meanwhile, GIOV includes price factor; therefore it cannot reflect the real tendency. This paper uses the producer price index to get the real output as equation (14):

$$Y_i = \frac{GIOV_i}{PIP_t} \cdot 100 \quad (14)$$

It is very obvious that the growth rate of PEs is much higher than the level of whole nation and SOEs which reflects PEs is more dynamic than SOEs.

Labor

Labor is another important input in economic growth, on the other hand, it is exactly serious for China to promote employment. The number of employed persons at year-end in industrial sector is offered in Statistical Yearbook of China (2002-2012). Along with the process of state-owned enterprises withdraw and private-owned enterprises enter the scale of SOEs contracts which is embodied in shrinking SOEs employment.

Capital accumulation

According to the data provided in the “Statistical Yearbook of China” and “China Industrial Economy Statistical Yearbook”, we decide to follow Tu and Xiao (2005); Zhang and Zhang (2011) to use the net value of fixed assets (NVFA) as the capital stock. Considering that the net value of fixed assets is nominal value, we use price index of investment in fixed assets (PI) to remove the price factor. This paper uses the net value of fixed assets at the end of the period as the indicator of capital accumulation, and then eliminates the asset price factor following the Equation (15):

$$K_i = \frac{NVFA_{i,t}}{PI_t} \cdot 100 \quad (15)$$

and the capital stock per capita is calculated as Equation (17)

$$k_{i,t} = \frac{K_{i,t}}{L_{i,t}} \quad (16)$$

Wage

The data of industrial wage is not provided directly, so we have to undertake the processing of relevant data. The yearbook only supplies the total wages and number of employment in SOEs and NSOEs by sector in urban, so we will sum over the industrial wages and number of employment and then get the average wage through dividing the total wages by employment numbers. And the nominal wages $\omega_{i,t}$ should be taken the price factor P^Y off.

$$\omega_{i,t} = \frac{W_{i,t}}{L_{i,t} \cdot P^Y} \quad (17)$$

Financial constraint difference

As mentioned, many researchers focused on the measurement of financial constraint and the impact of financial constraint on economic growth. However, it is barely noticed that the financial

constraint difference between SOEs and PEs in China. So it is very important to select such appropriate indicator to reflect the financial constraint difference. PEs have always been confronted with the financing difficulty, the financing cost of PEs is higher than SOEs because the PEs lack of state-owned background. So this paper will use an index describe the financial constraint, which is the ratio of interest expense (IE) to total liabilities (TL), which is estimated as Equation18.

$$r_i = \frac{IE_{i,t}}{TL_{i,t}} \cdot 100 \tag{18}$$

It is so clear that the financing cost of PEs exceeds SOEs and the gap has widened from 2001 in China. PEs have trouble in getting access to capital from banks, even if PEs get loans from financial intermediaries, they have to afford higher financing cost. So compared to SOEs, PEs are always being treated unfairly in the process of financing as a result of the banks discrimination.

CALCULATION RESULT AND ANALYSIS

Model I

Corresponding to Equation (1), we get the regression equation after the logarithm as follows:

$$\ln Y_t = \ln A + \alpha \cdot \ln K_{s,t} + \beta \cdot \ln K_{p,t} + \gamma \cdot \ln L_t + \varepsilon \tag{19}$$

where Y_t is real gross industrial output value; $K_{s,t}$ and $K_{p,t}$ are respectively the capital accumulation of SOEs and PEs; L_t is the number of employment at the end of year. Basing on the above analysis, the regression result of Equation19 is shown in TABLE 1.

According to TABLE 1, the industrial production function is represented

$$\ln Y_t = -4.5421 + 0.6129 \cdot \ln K_{s,t} + 0.2570 \cdot \ln K_{p,t} + 0.5089 \cdot \ln L_t \tag{20}$$

following Equation (5) and (19), we can get $(\alpha/K_s - \beta/K_p)$ shown in TABLE 2.

From TABLE 2, it is very obvious that D has always been less than zero, which means that the PEs marginal product of capital is higher than SOEs. This empirical result verifies this paper expectation and provides foundation for post-study. According to the result, we can conclude that the behavior of financial intermediaries goes against the principles of economics: the banks prefer to distribute the resource to the inefficient sector, and ask for lower returns.

Model II

As to analyze the effect of financial constraint difference on capital accumulation per capita, we need to transfer equation (13) to linear form by taking the logarithm of both sides of equation above and get the :

$$\ln k_p = \ln \alpha_0 + \alpha_1 \cdot \ln \left(\frac{\omega_p}{\omega_s} \right) + \alpha_2 \cdot \ln \left(\frac{\gamma_p}{\gamma_s} \right) + \alpha_3 \cdot \ln k_s + \varepsilon \tag{21}$$

The coefficient α_1 could tell me the relationship between k_p and ω_p/ω_s . And we can also figure out that how the financial constraint difference effect on PEs capital stock through estimating the

coefficient α_2 which we are taking considerable interest in. This paper can conclude the influence degree of financial constraint difference on PEs capital stock from α_2 . If $\alpha_2 < 0$, the financial constraint plays negative role on PEs capital accumulation, meanwhile k_p will decrease α_2 units when the financial constraint difference increases one unit. The regression result is shown in TABLE 3.

TABLE 1: The regression of model I

	Dependent variable			
	$\ln Y_t$			
$\ln K_{s,t}$	-10.8908*** (0.1118)			0.6129*** (0.11819)
$\ln K_{p,t}$		0.4694*** (0.0277)		0.2570*** (0.01836)
$\ln L_t$			3.0127*** (0.3162)	0.5089** (0.1569)
Constant	-10.8908*** (1.2217)	4.7904*** (0.2457)	-17.7484*** (2.7983)	-4.5421*** (0.7276)
Observations	11	11	11	11
R ²	0.9563	0.9599	0.8832	0.9979
Adj. R ²	0.9527	0.9565	0.9835	0.9973
Res. Std. Err.	262.9	287.1	90.78	1584
F-Sta.	-10.8908*** (0.1118)			0.6129*** (0.11819)

Note : Signif. Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

TABLE 2: The Comparison of SOEs and PEs Marginal Product of Capital

Year	2001	2002	2003	2004	2005	2006
	-9.95e-05	-6.63e-05	-3.78e-05	-2.00e-05	-1.49e-05	-1.06e-05
Year	2007	2008	2009	2010	2011	
	-7.92e-06	-3.42e-06	-2.61e-06	-1.14e-06	-1.16e-06	

Source: The author estimates

As the result presented in row (4) from TABLE 3, the coefficient of $\ln(\gamma_s/\gamma_p)$ which implies the finance constraint difference between SOEs and PEs is significant negative in Model II regression. Theoretically, if the gap of financial constraint difference grows one unit, the PEs capital stock will be cut down 1.19 units. This evidence supports the previous assumption. The phenomenon happening in China is contrary with the economic theory: the banks tend to distribute resource to SOEs instead of PEs which is more productive in capital output. As a result, PEs cannot finance sufficient funds to purchase machines and hire employees to expand scale of production or business operation, and then restrict capital accumulation and economic growth.

Simultaneously, we can also obtain some interesting conclusion through analyzing the coefficients of $\ln(\omega_p/\omega_s)$ and $\ln k_s$ in multiple regressions. The regression result of $\ln(\omega_p/\omega_s)$ is significant positive which signifies that the wage difference of two sectors implies positive effect on PEs capital accumulation, which presents that the more PEs wage exceeds SOEs, PEs will accumulate more capital stock. It makes sense that if PEs' wage increase faster than SOEs, the position in PEs sector should be more attractive to skilled employees whom can improve the investment productivity and then

enhance PEs capital accumulation. Combining row (3) with and (4) in TABLE 3, it could be found that when $\ln k_s$ rises one unit $\ln k_p$ just increases 0.6 to 0.8 unit. This result accord with the analysis results above, SOEs capital accumulation per capita rise much faster than PEs, because of SOEs obvious superiority of stated-owned background.

TABLE 3: The regression of model II

	Dependent variable			
	$\ln k_p$			
	(1)	(2)	(3)	(4)
$\ln(\gamma_s / \gamma_p)$	-2.71640*** (0.30266)			-1.18910** (0.25402)
$\ln(\omega_p / \omega_s)$		-2.51926*** (0.44002)		2.34745*** (0.36510)
$\ln k_s$			0.60776*** (0.05585)	0.83425*** (0.09054)
Constant	1.28387*** (0.05527)	1.64087*** (0.04403)	-0.26000 (0.17223)	-1.12504** (0.25997)
Observations	11	11	11	11
R ²	0.9097	0.732	0.908	0.9943
Adj. R ²	0.8984	0.7097	0.9003	0.9914
Res. Std. Err.	0.082	0.1619	0.09483	0.02384
F-Sta.	80.55	32.78	118.4	347.3

Note : Signif. Codes: 0 '****' 0.001 '***' 0.01 '**' 0.05 '.' 0.1 ' ' 1

CONCLUSIONS

According to the above analysis, this paper makes some conclusions as follows:

Firstly, the rate of SOEs capital accumulation is higher than PEs. Compared to PEs, SOEs have advantages in the field of financing and investment on account of their state-owned background. In China, the financial institutions prefer to provide loans to SOEs considering financing safety. So SOEs could finance adequate funds to invest in expanding production scale, meanwhile, PEs hardly promote investment quickly with financial restrict. After investment converting to capital, SOEs stock will accumulate faster than PEs.

Secondly, this paper testifies that PEs capital output efficiency is higher than SOEs. We can undoubtedly conclude that PEs marginal output of capital stock is higher than SOEs. Comparing with the first conclusion, although PEs capital stock inferiors to SOEs, they promote total output more efficient and gain more return in production. As a result the financial intermediaries should introduce more flexible policies to improve PEs financing environment instead of driving them away from financial market.

Thirdly, in China the banks make confusing decision in distributing resource to less efficient department. In theory, financial sector tend to extend credit to more productive and profitable department in pursuit of profit. However the banks would rather allocate loans to SOEs which is less inefficient than PEs in China. This may be reasonable taking ownership difference into consideration. In the process of financial liberation, the financial intermediaries, especially state-owned banks, remain preferring SOEs rather than PEs. It is because SOEs owns more land and currently land is the most guaranteed collateral because of the land price in China.

REFERENCE

[1] J.Robinson; The Generalization of the General Theory, London: Macmillan (1952).

- [2] S.Myers, N.Majluf; Corporate Finance and Investment Decisions when Firm Have Information that Investors Do not Have, *Journal of Financial Economics*, **13**, 187-221 (1984).
- [3] R.Lucas; On the Mechanics of Economic Development, *Journal of Monetary Economics*, **22**, 3-42 (1988).
- [4] R.G.King, R.Levine; Finance and Growth: Schumpeter might be right, *The Quarterly Journal of Economics*, **108(3)**, 717-37 (1993).
- [5] R.Levine; Finance and Growth: Theory and Evidence, *Handbook of Economic Growth* (2005).
- [6] J.B.Ang; "A Survey of Recent Developments in the Literature of Finance and Growth," *Journal of Economic Surveys*, **22(3)**, 536-576 (2008).
- [7] P.Valickova, T.Havranek, R.Horvath; Financial development and economic growth: A meta-analysis, *IOS Working Papers* (2013).
- [8] R.C.Merton, Z.A.Bodie; *Conceptual Framework for Analyzing the Financial Environment, The Global Financial System: A Functional Perspective*, Boston: Harvard Business School Press (1995).
- [9] R.Levine; Financial Development and Economic Growth Views and Agenda. *Journal of Economic Literature*, **35(6)**, 688-726 (1997).
- [10] Q.S.An, W.H.Peng; Analysis on the Paradox of Financial Inefficiency and High Economic Growth in China Transition Economy, **10**, 60-63 (2010).
- [11] S.M.Fazzari, B.C.Petersen, R.G.Hubbard; Financing constraints and corporate investment, NBER Working Paper No. w2387, National Bureau of Economic Research, December (1988).
- [12] A.K.Kashyap, O.A.Lamont, J.C.Stein; Credit Conditions and the Cyclical Behavior of Inventories, *The Quarterly Journal of Economics*, **104**, 565-592 (1994).
- [13] X.Hu, F.Schiantarelli; Investment and Capital Market Imperfections: a Switching Regression Approach Using U.S. Firm Panel Data, *The Review of Economics and Statistics*, **80(3)**, 466-479 (1998).
- [14] J.Li, S.M.Li, Z.Yan; An Analysis of Performance and Risk of Equity Refinancing of Listed Companies in China, *Journal of Basic Science and Engineering*, **14**, 106-111 (2006).
- [15] Q.Wang, C.Lin, S.N.Wu; Financial Constraint, Corporate Management and Investment-Cash Flow Sensitivity, *Contemporary Finance and Economics*, **12**, 104-109 (2008).
- [16] P.Xie; The reform of State-owned Bank during Thirty Years, *Fortune Today (Finance Version)*, **10**, 9-12 (2008).
- [17] Y.J.Xu; *Financial Development and Financing Constraints: Based on the Cash Flow Sensitivity of Cash*, JiNan University (2011).
- [18] Z.G.Xiao, G.Xiao; China Industrial Productivity Revolution, *Economic Research Journal*, **3**, 4-15 (2005).
- [19] C.Zhang, Y.Zhang; Do the State-owned Enterprises Have Low Efficiency? *Economist*, **2**, 16-25 (2011).