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Does financial deleveraging affect governments' desirability of privatization? Evidence from the Chinese listed local SOEs

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Does financial deleveraging affect governments' desirability of privatization? Evidence from the Chinese listed local SOEs

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ABSTRACT
The rapid growth of local SOEs in China largely depends on high leverage, thus local governments and their SOEs will face harder budget constraints when the central bank implements tight credit policies. Using a sample of listed local SOEs in the Chinese A-share market, this paper attempts to investigate the relationship between financial deleveraging and privatization of local SOEs. We find that privatization of the Chinese local SOEs increases significantly during financial deleveraging, and this effect is more pronounced among SOEs with less tax contribution, fewer employees and that cause greater financial burden to the local governments. This paper broadens the research on environmental factors that drive politicians to privatize.

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Financial deleveraging; privatization; local state-owned enterprises

1. Introduction

Although it has been nearly four decades since privatization was introduced into the world, privatization in China is still ongoing. Unlike other transition economies who implemented "shock therapies", the Chinese government has adopted a gradual privatization strategy (G. M. Chen et al., 2006). China's large-scale privatization took place during 1995 – 2002, which was sanctioned by the central government and actively responded by the local governments. However, relative to the previous period, privatization in China after 2002 continues on a smaller scale and is mainly a decision of local governments absent central government policy. Even so, China has been still one of the most active countries in privatization between 2009 and 2016, and its privatization trade volume has ranked first in the world for many years.[1]

As the owners of state-owned enterprises (SOEs), the governments' willingness to reform will ultimately determine whether privatization happens (K. Guo & Yao, 2005). Therefore, existing literature on the causes of the Chinese privatization primarily focuses on government motivations. There are three main points of view: The first line of

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[1]The data is from Privatization Barometer Database, www.privatizationbarometer.net. The amount of transactions in the database refers to the funds raised by share issue privatization (SIP) and private equity, including both partial and full privatization.

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thinking argues that increasing fiscal revenue or reducing financial burden is the main reason for local governments to privatize their SOEs (D. Li & Lui, 2004; Han & Oi, 2008; Zhu, 2004). The second line of thinking is that the purpose of governments privatizing SOEs is to improve enterprise efficiency (Gupta et al., 2008). The third line of thinking supports political motivation. For example, Xia and Chen (2007) and Yang et al. (2010) document that the local governments tend to control large-scale and regulated industry firms. Collectively, these studies merely concentrate on the relationship between government motivation and privatization without considering macro-environment that affects the governments' willingness to privatize.

Then, do environmental factors affect the governments' willingness to privatize? Several studies have explored the impact of China's institutional change on privatization. Cao et al. (1999) argue that reforms in tax, fiscal, monetary and banking systems in the 1990s have hardened the local governments' budget constraints and triggered the privatization of local SOEs. S. Li et al. (2000) document that cross-regional competition played an important role in driving the local governments to privatize. Brandt et al. (2005) show that banking reform played an integral role in inducing the township and village enterprises to be privatized. H. Li (2003) and K. Guo and Yao (2005) also attribute the privatization to the hardened budget constraints and market competition. Surprisingly, however, there is scarce literature on what drives the Chinese local governments to privatize in the 21st century. Obviously, institutional change mentioned above cannot explain China's privatization in recent ten years, thus it is of great academic interest to provide new explanation for this, especially in the case that China's institutional and economic environment is rapidly changing.

In this paper, we study the influence of financial deleveraging on privatization of local SOEs in the past decade. China's credit supply has exhibited cyclical features since 1998. Typically, the People's Bank of China (PBC) implements a credit expansion policy in bad times and a credit crunch policy in good times. Following Bezemer and Zhang (2014), we use the method of Hodrick-Prescott filter to identify financial deleveraging and financial leveraging in China. By employing a Logit model and using a sample of listed local SOEs in the Chinese A-share market from 2004 to 2017, we find that financial deleveraging can increase the probability of a local SOE being privatized. In particular, SOEs with less tax contribution, fewer employees and that cause greater financial burden to the local governments are more likely to be privatized during financial deleveraging. Overall, our results indicate that stabilizing tax revenue, minimizing unemployment and reducing financial burden are important considerations for local governments when selecting SOEs to privatize.

Our paper has important theoretical contributions and policy implications. First, the current literature on factors that influence China's privatization mainly focuses on the local government motivations. Even though several articles explored the impact of institutional changes on privatization, they mainly focus on privatization in the 1990s. By using more recent Chinese privatization data, this paper contributes to this strand of literature by showing that macro environment plays a key role in driving local governments to privatize, and provides a new explanation for privatization in China in the 21st century. Second, it enriches the literature on the consequences of financial deleveraging. The current literature mainly focuses on the macro-effects caused by financial deleveraging by using cross-country data, but our paper is an empirical study on its micro-

consequences within one country. Third, our findings indicate that stabilizing finance and keeping employment are important considerations for local governments when making privatization decision. Therefore, the central government, in order to encourage local governments to abandon SOEs that are uncompetitive but pay more taxes, have more loss or redundancy, should deepen reform of fiscal and taxation system and formulate measures to compensate local governments' loss caused by efficiency-enhancing privatization.

The rest of our paper is organized as follows: Section 2 is the theoretical analysis and research hypothesis; Section 3 describes data sources and research design in detail; Section 4 is empirical analysis, testing the relationship between financial deleveraging and privatization, and which types of SOEs that the local governments are more likely to privatize during financial deleveraging. Robustness checks are presented in Section 5. Section 6 is the concluding remarks.

2. Theory and hypotheses

2.1. Financial deleveraging and privatization of local SOEs

Privatization in China is mainly prompted by local governments (Qian & Weingast, 1997). Therefore, financial deleveraging may promote privatization by affecting the governments' willingness to privatize. In what follows we analyze how financial deleveraging influences local governments' desirability of privatization.

First, Financial deleveraging has side effects on GDP growth in the short term caused by a reduction of total credit supply in the society (Bernanke & Gertler, 1995; Devlin & McKay, 2008; International Monetary Fund, 2008; Ma et al., 2016), as reforms usually occur when external environment becomes unfavorable, so local governments will seek reform strategies to support economic growth. In particular, China's unique fiscal decentralization that requires the local governments to share most of their tax revenue with the central government but take the main responsibility for local public expenditure makes the local governments face strong budget constraints. The local governments need to obtain more fiscal revenue through economic development in order to provide public services and maintain social stability. More importantly, the promotion of local officials in China is in the hands of the central government who usually uses economic indicators such as regional economic growth and fiscal revenue to evaluate the performance of local officials (H. Li & Zhou, 2005; Y. Chen et al., 2005). As a result, the local governments in China have a higher initiative to pursue economic growth. Developing private economy is conducive to enhancing economic growth (Barnett, 2000; Berkowitz & DeJong, 2003; Patrick, 1997) and improving local fiscal conditions (Zhu, 2004). Therefore, local governments have incentives to increase support for the private economy, and privatizing SOEs can make this support more credible.

Second, Financial deleveraging will harden the budget constraints of local SOEs. The Chinese local governments' implicit guarantee for local SOEs has induced soft budget constraints problems for a long time. Specifically, SOEs with lower profitability and even loss can still survive through bank loans and pay taxes to the local governments (K. Guo & Yao, 2005). Financial deleveraging in large part reflects the central government's intentions who often exerts influence on the PBC's decision-making (Chen and Zha,

2018). In order to avoid being punished, not only the banks quickly respond to the credit policies, but also the local governments reduce their intervention in the credit allocation. Then, banks strengthen their risk awareness and are motivated to allocate scarce credit resources to more profitable and efficient firms. This fact is supported by Cong et al. (2019), they show that more capital was allocated to firms with higher productivity during the credit crunch period, but stimulus-driven credit expansion reverses this allocation process. Hardened budget constraints make it difficult for the local governments to finance the inefficient SOEs and they have to use their own financial resources to keep the SOEs survive (Cao et al., 1999), which will cause a heavy financial burden to the local governments and hence reduce their willingness to control such SOEs.

Third, Financial deleveraging can reduce social consumption and increase demand uncertainty in the short term. Less capital supply and higher costs of debt induce liquidity problems. As a response, firms may reduce investment, hold down wages and even lay off workers (Ma et al., 2016), which is followed by a decline in demand for consumer goods. According to the view of informational gains, private enterprises respond more quickly to consumer demand, input costs and other information compared with public-owned enterprises (Glaeser & Scheinkman, 1996; Gupta et al., 2008). Therefore, the local governments are more likely to privatize their SOEs to improve the flexibility of firms' management when the SOEs are subject to demand shock, which is conducive to enhancing enterprise efficiency and increasing tax revenue.

In summary, financial deleveraging puts the local governments into a disadvantaged position through slowing economic growth, hardening SOEs' budget constraints and reducing social demand in the short run, which will discourage their willingness to control SOEs and thus privatization may take place. On the basis of arguments above, this paper proposes the following hypothesis:

H1: *Financial deleveraging has a positive effect on the probability of a local SOE being privatized.*

2.2. Heterogeneous effects of financial deleveraging on privatization of local SOEs

In China, fiscal revenue of local governments mainly comes from taxes and government funds——income from auction of state-owned land (Q. Guo, 2019). The slowdown of economic growth and the decline of social demand reduce the sales and profits of firms when financial deleveraging occurs. In addition, the capital investment of the firms will also decline due to the reduction of credit loans, leading to lower wages and higher unemployment (Cuerpo et al., 2015). As a result, the local governments' revenue from value added taxes related to sales activity and income taxes related to business or personal income can fall significantly. Bernanke and Gertler (1995) document that the impact of tight monetary policy on household demand is first reflected in housing investment of a family, causing a sharp decline in housing demand. In China, financial deleveraging is always accompanied by tight monetary policy, so it can be reasonably inferred that

financial deleveraging will lead to a decline in housing demand and affect the local governments' revenue stemming from government funds. Therefore, the local governments have a strong incentive to try their best to stabilize the taxes from SOEs because they are easier to be controlled. So, how to reduce tax loss as much as possible while promoting privatization? As the information asymmetry between SOEs and the local governments is lower relative to private firms, it is difficult for SOEs to evade taxes by hiding income (Liu & Li, 2012). From this point of view, a rational local government will choose to control the SOEs that make more tax contribution. Therefore, we propose the following hypothesis:

H2: *Relative to the SOEs with more tax contribution, the SOEs with less tax contribution are more likely to be privatized by local governments during financial deleveraging.*

High regional unemployment rate may hinder the political promotion of local officials. Therefore, how to minimize unemployment is usually a key issue for local governments in the process of privatization. Hu et al. (2006) document that privatization in China is not accompanied by higher unemployment, which probably implies that local governments in China considered employment problem in advance (D. Li & Lui, 2004) and choose to privatize SOEs first with fewer employees. D. Li and Lui (2004), Hu et al. (2006), Xia and Chen (2007) and Yang et al. (2010) find that governments tend to retain the large SOEs and privatize the small ones. Given the rise in unemployment during financial deleveraging, the Chinese local governments' preference for this kind of privatization sequencing should be more prominent. In view of this, we propose our third hypothesis:

H3: *Relative to the SOEs with more employees, the SOEs with fewer employees are more likely to be privatized by local governments during financial deleveraging.*

In addition to increase revenue, saving expenditure can also help alleviate the fiscal pressure faced by the Chinese local governments during financial deleveraging. Therefore, the SOEs that create high fiscal pressure for the local governments are likely to be privatized first. Bai et al. (2006) find that privatizing unsustainable SOEs can reduce the financial burden of local governments. D. Li and Lui (2004) indicate that the local governments would like to privatize SOEs only when the huge debts and losses of the SOEs needed to be borne by the government. Huang (2019) shows that the purpose of local governments privatizing SOEs is not to improve the performance of SOEs but to reduce subsidies to them. Combining the views of these literature, we think that only the loss itself does not necessarily lead to privatization of local SOEs. Profit-losing SOEs may have higher sales income and still be able to pay value added taxes (K. Guo & Yao, 2005), or profit-losing SOEs are still able to access to bank loans and do not need the assistance of local governments. Therefore, if the profit-losing SOEs rely on the assistance of local governments to operate, with the fiscal pressure increasing during financial deleveraging, the local governments are likely to privatize them to get rid of the burden. Based on the arguments above, this paper proposes the following hypothesis:

H4: *The SOEs with more losses and more government subsidies are more likely to be privatized by the local governments during financial deleveraging.*

3. Research design

3.1. Sample selection and data sources

The initial sample of this paper includes all the listed SOEs in the Chinese A-share market from 2004 to 2017. The China Securities Regulatory Commission (CSRC) has required all listed companies to disclose the information of controlling shareholders and ultimate owners since 2003, so we choose 2004 as the starting point of our sample period in order to observe the annual change of the ultimate owners of firms. Ultimate owners and financial data of sample firms mainly come from the China Stock Market and Accounting Research (CSMAR) database, which provides comprehensive data on China's capital market. The data of regional GDP, value of the secondary industry, value of import and export trade, and unemployment rate come from the Economic Statistical Yearbook of each province. The data of credit to private sector (credit to households and credit to non-financial corporations) comes from the World Development Indicators (WDI) database of the world bank, in which we can get China's credit data from 1977. In order to generate a more precise time trend and define financial deleveraging accurately, we use the Chinese credit data from 1977 to 2017. We exclude the following kinds of firms: (1) Firms in the financial industry; (2) Public utility firms; (3) Firms controlled by the central government; (4) ST, PT and insolvent firms[2]; (5) Firms in industries and province (Tibet) that have never experienced privatization during the sample period; (6) Firms with missing data for major variables. Thus, 8,485 observations of 1,009 firms make up our final sample, and 208 observations of privatization are included. All continuous variables are winsorized at 1 percent in order to reduce the estimation errors caused by extreme values.

3.2. Regression model and variable measures

In order to test the impact of financial deleveraging on the privatization of local SOEs, we estimate the following regression model at the firm-year level:

[2]ST (special treatment) refers to firms that suffer losses for two consecutive years, and PT (particular transfer) refers to firms that suffer losses for three consecutive years. Insolvent refers to firms with total liabilities greater than total assets.

$$\begin{aligned} Privatization_{i,t} = & \alpha + \beta_1 Deleverage_{i,t} + \beta_2 Strategy_{i,t} + \beta_3 PastROA_{i,t} + \beta_4 LnStaff_{i,t-1} \\ & + \beta_5 Growth_{i,t-1} + \beta_6 Lev_{i,t-1} + \beta_7 Efficiency_{i,t-1} + \beta_8 Structure_{i,t} \\ & + \beta_9 Openness_{i,t} + \beta_{10} Unemployment_{i,t} + \beta_{11} VOL_{i,t} \\ & + \sum Industry + \sum Province + \varepsilon_{i,t} \end{aligned} \tag{1}$$

Where *Privatization* is an indicator variable that equals one if the ownership of the local SOE *i* is transferred to private entities[3] in year *t*, and zero otherwise.

Deleverage denotes financial deleveraging. Following Bezemer and Zhang (2014), we use the financial deleveraging year dummies (*Del_Dum*) generated by the extent to which credit to private sector/GDP (*Debt/GDP*) deviates from its long-term trend to measure *Deleverage*. Specifically, we first use the Hodrick-Prescott filter (HP) with a smoothing parameter of 400 to separate the trend and cyclical component in *Debt/GDP*. The cyclical component is the deviation of *Debt/GDP* from its trend and is denoted by *Cycle*. *Cycle* being positive means the credit is expanded, and otherwise the opposite. Then, we calculate the standard deviation of *Cycle*, namely σ(*Cycle*). When *Cycle* is negative and its absolute value is more than ασ (*Cycle*) with α = 1, we define the year as a local trough of the credit cycle. Finally, we define the local peaks of the credit cycle in which the cyclical component *Cycle* is higher than in both the previous and posterior year. Years between the peak and the trough (excluding the peak year) are defined as financial deleveraging years, for which the variable *Del_Dum* takes value one, and zero otherwise.[4] Since *Del_Dum* is a year-dummy variable, it may capture other time trend factors as well as financial deleveraging. In order to eliminate the proxy errors, we also use *Debt/GDP* as the explanatory variable and observe whether there is a negative correlation between *Debt/GDP* and *Privatization*, so that *Debt/GDP* and *Del_Dum* can complement each other.

Control variables. According to the literature on causes of privatization or privatization sequencing, we include control variables reflecting firm characteristics as follows: an indicator of strategic industry (*Strategy*),[5] average profitability over the past two years (*PastROA*), number of employees (*LnStaff*), sales growth rate (*Growth*), interest-bearing debt ratio (*Lev*) and employee productivity (*Efficiency*). Then, regional variables including industrial structure (*Structure*), openness (*Openness*) and unemployment (*Unemployment*) are controlled as well. Generally speaking, local governments are more open-minded and have greater support for private economy in areas with high industrialization and opening up, while they may oppose privatization in areas with high unemployment because employment issues affect their political promotion. In addition, financial leverage volatility (*VOL*) has a negative impact on economic growth and aggravates financial uncertainty (Ma et al., 2016), which may affect the privatization of local SOEs, so we also control for it. Finally, we control for industry and province effects

[3]We define the ultimate owner as a local state entity if the code of its nature in the CSMAR database is 1100 (i.e., state-owned enterprises), 2000 (i.e., administrative organs and institutions) and 2120 (i.e., local institutions), and otherwise we define it as a private entity.

[4]The unreported results show that 2004 – 2008, 2010, 2011 and 2017 are financial deleveraging years.

[5]We define the military, power grid, petroleum and petrochemical, telecommunications, coal, civil aviation and shipping industry as strategic industries.

Table 1. Variable definitions.

Variable type	Variable name	Variable definition
Dependent variable	*Privatization*	An indicator variable that equals one if the ownership of the local SOE is transferred to private entities
Independent variable	*Del_Dum*	Financial deleveraging year dummies, 1 if the firm is in year 2004–2008, 2010, 2011 and 2017, 0 otherwise.
	Debt/GDP	Financial leverage ratio that equals China's credit to private sector scaled by the gross domestic product (GDP)
Control variable	*Strategy*	An indicator variable that equals one if the firm is in the strategic industry
	PastROA	Average ROA over the past two years. ROA equals net profit excluding the extraordinary gains and losses scaled by total assets and then adjusted by industry's mean
	LnStaff	The natural logarithm of the number of employees
	Growth	(Sales revenue this period – sales revenue last period)/sales revenue last period
	Lev	Sum of short-term loans, long-term loans, non-current liabilities due within one year and bonds payable divided by total assets, and then adjusted by industry's mean
	Efficiency	(Sales revenue/number of employees) $\times 10^{-6}$
	Structure	Added value of the secondary industry scaled by regional GDP
	Openness	The natural logarithm of the regional total value of import and export trade per capita
	Unemployment	An indicator variable that equals one if the regional unemployment rate is above the annul median
	VOL	Absolute value of the cyclical component in credit to private sector scaled by GDP
	Industry	1 if the firm is in industry k, 0 otherwise
	Province	1 if the firm is in Province j, 0 otherwise

Table 2. Descriptive statistics of main variables.

Panel A: Summary statistics

Variable	Mean	Sd	Min	P50	Max	N
Privatization	0.025	0.155	0	0	1	8,485
Del_Dum	0.567	0.495	0	0	1	8,485
Debt/GDP	127.970	17.545	101.917	126.300	156.820	8,485
Strategy	0.222	0.415	0	0	1	8,485
PastROA	0.019	0.082	−0.267	0.008	0.415	8,485
LnStaff	7.795	1.342	3.932	7.818	10.812	8,485
Growth	0.180	0.442	−0.568	0.109	2.939	8,485
Lev	0.019	0.160	−0.394	0.008	0.568	8,485
Efficiency	1.870	3.334	0.101	0.835	22.653	8,485
Structure	46.581	8.065	19.014	48.400	61.500	8,485
Openness	9.298	1.524	6.105	9.376	11.618	8,485
Unemployment	0.470	0.499	0	0	1	8,485
VOL	8.192	6.296	0.151	5.229	23.507	8,485

Panel B: Difference test for *Privatization* and *Debt/GDP* by *Del_Dum*

	Del_Dum = 1			*Del_Dum* = 0				
Variable	N	Mean	Median	N	Mean	Median	Difference in Mean	Difference in Median
Privatization	4,815	0.035	0	3,670	0.015	0	0.020 ***	0***
Debt/GDP	4,815	113.806	111.843	3,670	141.787	140.147	− 27.981 ***	−28.304***

In Panel B, the mean difference test is implemented by t-test, and the median difference test is implemented by Wilcoxon rank sum test.

by using dummy variables, and cluster standard errors at the firm level. Detailed definitions of the variables used in the baseline regressions are shown in Table 1.

4. Empirical results

4.1. Descriptive statistics

Table 2 Panel A presents the result of descriptive statistics. The mean value of *Privatization* is 0.025, indicating that 2.5 percent of local SOEs in our sample are privatized. *Del_Dum* has a mean value of 0.567, implying an even distribution of our samples in years of financial deleveraging and financial leveraging. The mean value of *Strategy* is 0.222, suggesting that 22.2 percent of local SOEs in our sample belong to strategic industries. *PastROA* has a mean value of 0.019, indicating that the average profitability of local SOEs over the past two years is 1.9 percent higher than the industry mean value. The sales growth rate has a mean value of 18 percent but has a standard deviation of 0.442, implying that the growth of local SOEs has a significant variation. The interest-bearing debt ratio ranges from −0.394 to 0.568, suggesting that some local SOEs' interest-bearing debt ratio are lower but others are higher than industry mean, so the leverage level of local SOEs varies greatly.

Table 2 Panel B reports the results of difference test for *Privatization* and *Debt/GDP* by *Del_Dum*. 3.5 percent of local SOEs are privatized in years of financial deleveraging——the mean value of *Privatization* is 0.035 when *Del_Dum* = 1, while 1.5 percent of local SOEs are privatized in years of financial leveraging——the mean value of *Privatization* is 0.015 when *Del_Dum* = 0. The mean difference test for *Privatization* shows a significant difference, indicating that more local SOEs are privatized in financial deleveraging years than in financial leveraging years, which implies the positive relationship between financial deleveraging and privatization again. In addition, the mean value of *Debt/GDP* in financial deleveraging years (113.806% when *Del_Dum* = 1) is significantly lower than in financial leveraging years (141.787% when *Del_Dum* = 0), suggesting that the financial leverage ratio is lower in deleveraging years and the variable *Debt/GDP* can complement *Del_Dum* well.

4.2. Regression results of financial deleveraging and privatization of local SOEs

Table 3 reports the results from estimating model (1).[6] Columns (1) and (2) show the estimations of the effect of financial deleveraging on privatization with only the industry fixed effect and province fixed effect. In Columns (3) and (4), we add other control variables to the regressions. The results in Columns (1) and (3) show that in financial deleveraging years, the probability of local SOEs being privatized by the governments increases significantly at the 1% level. Since the coefficient estimated by Logit regression[7] has no practical meaning and given that *Del_Dum* is a variable with values of 0 and 1, we can calculate its odds ratio, which is 1.84 and 2.30 respectively, suggesting that the odds ratio of privatization of local SOEs

[6]The privatized firms are only 2.45% (208/8485) in our sample, so privatization is a rare event. Following King and Zeng (2001), we use the relogit command to modify the Logit model and find results similar to Table 3.

[7]Probit model is also used for the analysis of binary dependent variable issues, so we also use Probit to estimate model (1). The unreported results show that variables' marginal effects, model's goodness of fit and model's percent of correctly predicted is very similar to that of Logit. Given that *Del_Dum* is a variable with values of 0 and 1, we chose Logit to perform our regression analyses because it allows us to calculate the odds ratio of *Del_Dum*. Thus, we could easily explain the economic effect of deleveraging on SOEs' privatization.

Table 3. Financial deleveraging and privatization of local SOEs.

	Privatization			
Variable	(1)	(2)	(3)	(4)
Del_Dum	0.833***		0.612***	
	(5.530)		(3.122)	
Debt/GDP		−0.022***		−0.019**
		(−5.311)		(−2.232)
Strategy			−0.996***	−0.999***
			(−3.073)	(−3.066)
PastROA			−4.134***	−4.179***
			(−3.101)	(−3.212)
L_LnStaff			−0.547***	−0.550***
			(−7.320)	(−7.341)
L_Growth			−0.111	−0.106
			(−0.794)	(−0.756)
L_Lev			0.875**	0.899**
			(1.981)	(2.068)
L_Efficiency			−0.164***	−0.165***
			(−3.142)	(−3.143)
Structure			0.022	0.018
			(1.058)	(0.813)
Openness			−0.465**	−0.480**
			(−2.132)	(−1.972)
Unemployment			−0.573**	−0.608**
			(−2.217)	(−2.261)
VOL			−0.029**	−0.030**
			(−2.403)	(−2.171)
Constant	−5.248***	−1.984*	4.196	7.293***
	(−6.065)	(−1.869)	(1.568)	(2.893)
Industry FE	YES	YES	YES	YES
Province FE	YES	YES	YES	YES
Pseudo R^2	0.056	0.053	0.128	0.127
Observations	8,485	8,485	8,485	8,485

z-value is presented in (). Standard errors are clustered at the firm level. ****, ** and * denote significance levels of 1%, 5% and 10%, respectively.

increases by 84%–130% in financial deleveraging years compared to financial leveraging years. The results in Columns (2) and (4) show that the lower the financial leverage ratio, the more likely are the local SOEs to be privatized. By calculating the marginal effect of *Debt/GDP*, we find that the probability of privatization of local SOEs will increase by 52%–60% relative to the sample average (0.025) if *Debt/GDP* reduces 30% (the difference between the mean value of *Debt/GDP* when *Del_Dum* = 1 and *Del_Dum* = 0). Moreover, privatization also reflects the determination of the local governments to reform SOEs and will have a profound impact on the beliefs of the public and economic prospects. Together with results in Table 3, we conclude that the effect of financial deleveraging on privatization is large.

4.3. Regression results of heterogeneous effects of financial deleveraging on privatization of local SOEs

The empirical findings thus far show that financial deleveraging can significantly increase the probability of privatization of local SOEs, the question we want to

explore next is what types of SOEs the local governments tend to privatize. According to the theoretical analysis above, tax contribution, unemployment and financial burden may be important factors that local governments concern about in the privatization decision. Therefore, in order to test hypotheses 2, 3 and 4, we estimate the following three regression models respectively:

$$Privatization_{i,t}=\alpha+\beta_1 Deleverage_{i,t}+\beta_2 LowTax_{i,t}+\beta_3 Deleverage_{i,t}*LowTax_{i,t}+\beta_j Controls+\varepsilon_{i,t} \tag{2}$$

$$Privatization_{i,t}=\alpha+\beta_1 Deleverage_{i,t}+\beta_2 LowStaff_{i,t}+\beta_3 Deleverage_{i,t}*LowStaff_{i,t}+\beta_j Controls+\varepsilon_{i,t} \tag{3}$$

$$Privatization_{i,t}=\alpha+\beta_1 Deleverage_{i,t}+\beta_2 Loss_{i,t}+\beta_3 Subsidy_{i,t}+\beta_4 Loss_{i,t}*Subsidy_{i,t}+\beta_5 Deleverage_{i,t}*Loss_{i,t}+\beta_6 Deleverage_{i,t}*Subsidy_{i,t}+\beta_7 Deleverage_{i,t}*Loss_{i,t}*Subsidy_{i,t}+\beta_j Controls+\varepsilon_{i,t} \tag{4}$$

Where *LowTax* denotes that a firm contributes less to taxation, which is an indicator variable that equals one if the average tax paid by the firm in the past year is lower than the industry's annual median, and zero otherwise. *LowStaff* denotes that a firm has fewer employees, if the number of employees in the firm in the past year is less than the

Table 4. Financial deleveraging, tax contribution/scale of employees and privatization of local SOEs.

Panel A: Financial deleveraging, tax contribution and privatization of local SOEs

	Privatization	
Variable	(1)	(2)
*Del_Dum*LowTax*	0.670**	
	(2.168)	
*Debt/GDP*LowTax*		−0.022**
		(−2.084)
Del_Dum	0.181	
	(0.649)	
Debt/GDP		−0.005
		(−0.443)
LowTax	−0.477*	2.717**
	(−1.767)	(2.038)
Constant	4.492*	5.545**
	(1.684)	(2.049)
Control Variables	YES	YES
Industry FE	YES	YES
Province FE	YES	YES
Pseudo R^2	0.130	0.129
Observations	8,485	8,485

Panel B: Financial deleveraging, scale of employees and privatization of local SOEs

	Privatization	
Variable	(1)	(2)
*Del_Dum*LowStaff*	0.590*	
	(1.826)	
*Debt/GDP*LowStaff*		−0.020*
		(−1.798)
Del_Dum	0.228	
	(0.835)	
Debt/GDP		−0.006
		(−0.561)
LowStaff	−0.459	2.434*
	(−1.511)	(1.729)
Constant	4.738*	5.965**
	(1.749)	(2.205)
Control Variables	YES	YES
Industry FE	YES	YES
Province FE	YES	YES
Pseudo R^2	0.129	0.129
Observations	8,485	8,485

The coefficients of the control variables are not reported due to space limitations.

Table 5. Financial deleveraging, financial burden and privatization of local SOEs.

	Privatization					
Variable	(1)	(2)	(3)	(4)	(5)	(6)
*Del_Dum*Loss*	0.003		−0.085*			
	(0.146)		(−1.779)			
Del_Dum Subsidy*		−0.047	−0.083**			
		(−1.391)	(−2.078)			
*Del_Dum*Loss*Subsidy*			0.010**			
			(2.253)			
*Debt/GDP*Loss*				−0.0001		0.002
				(−0.148)		(1.082)
*Debt/GDP*Subsidy*					0.002	0.003*
					(1.383)	(1.941)
*Debt/GDP*Loss*Subsidy*						−0.0002*
						(−1.954)
Constant	2.767	1.188	−0.010	5.257**	4.257	4.000
	(1.004)	(0.292)	(−0.002)	(2.012)	(0.992)	(0.884)
Other Variables	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES
Pseudo R^2	0.145	0.153	0.167	0.144	0.151	0.165
Observations	8,220	7,002	7,001	8,220	7,002	7,001

(1) The coefficients of *Del_Dum*, *Debt/GDP*, *Loss*, *Subsidy*, *Loss*Subsidy* and control variables are not reported due to space limitations. (2) As we use the average EBIT over the past 3 years to define *Loss* and some SOEs are listed for less than four years with *Loss* to be a missing value, so observations in Columns (1) and (4) are 8220. (3) Data on government subsidies are only available from 2003, as we use the average government subsidies over the past 3 years to define *Subsidy*, so the regressions in Columns (2), (3), (5) and (6) start from 2006.

industry's annual median, we make *LowStaff* equal one and zero otherwise. *Loss* denotes the natural logarithm of the average loss of the firm over the past three years, but we make *Loss* equal zero if the average EBIT (earnings before interest and taxes) of the firm over the past three years is positive. *Subsidy* denotes the natural logarithm of the average government subsidies a firm has obtained over the past three years. *Controls* denotes control variables that are similar to model (1), and standard errors are clustered at the firm level as well.

Table 4 Panel A reports the results from estimating model (2). As shown, the coefficient for the interaction term of *Del_Dum* and *LowTax* in Column (1) is 0.670, which is positive and significant at the 5% level. The coefficient for the interaction term of *Debt/GDP* and *LowTax* in Column (2) is −0.022, which is negative and significant at the 5% level. Collectively, Table 4 Panel A Columns (1) and (2) suggest that compared with local SOEs with more tax contribution, local SOEs with less tax contribution are more likely to be privatized by governments during financial deleveraging. Thus, hypothesis 2 is supported. Table 4 Panel B reports the results from estimating model (3). As shown, the coefficient for the interaction term of *Del_Dum* and *LowStaff* in Column (1) is 0.590, which is positive and significant at the 10% level. The coefficient for the interaction term of *Debt/GDP* and *LowStaff* in Column (2) is −0.020, which is negative and significant at the 10% level. Taken together, Table 4 Panel B Columns (1) and (2) demonstrate that compared with local SOEs with more employees, local SOEs with fewer employees are more likely to be privatized by governments during financial deleveraging, which is consistent with hypothesis 3.

Table 5 Columns (1) and (4) show the estimations of the interaction effect of financial deleveraging and firm loss on privatization. The results show that neither

Table 6. Relative importance of tax contribution, scale of employees and financial burden.

	(1)	(2)	(3)	(4)
Variable	*Privatization*	Dominance Stat if *Del_Dum* = 1	*Privatization*	Dominance Stat if *Debt/GDP*<its median value
*Del_Dum*LowTax*	0.639**	0.0164 [5]		
	(2.038)			
*Del_Dum*LowStaff*	0.429*	0.0165 [4]		
	(1.792)			
*Del_Dum*Loss*Subsidy*	0.010**	0.0267 [2]		
	(2.300)			
*Debt/GDP*LowTax*			−0.018**	0.0154 [4]
			(−2.001)	
*Debt/GDP*LowStaff*			−0.011*	0.0141 [5]
			(−1.682)	
*Debt/GDP*Loss*Subsidy*			−0.0002*	0.0248 [2]
			(−1.918)	
Constant	0.059	—	1.106	—
	(0.014)		(0.231)	
Control Variables	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Province FE	YES	YES	YES	YES
Pseudo R^2	0.171	0.203	0.169	0.176
Observations	7,001	2,502	7,001	2,491

(1) The coefficients of *Del_Dum*, *Debt/GDP*, *LowTax*, *LowStaff*, *Loss*, *Subsidy*, *Del_Dum*Loss*, *Debt/GDP*Loss*, *Del_Dum*Subsidy*, *Debt/GDP*Subsidy*, *Loss*Subsidy* and control variables are not reported due to space limitations. (2) Columns (2) and (4) in the table shows the Relative Importance (RI) of each variable, and the relative ranking is presented in square brackets. (3) As *Debt/GDP* is a continuous variable, we define the deleveraging period according to its median in Column (4).

the coefficient for the interaction term of *Del_Dum* and *Loss* in Column (1) nor the coefficient for the interaction term of *Debt/GDP* and *Loss* in Column (4) is significant. Then, we argue that loss itself does not lead to privatization of a local SOE, this is inconsistent with the argument that SOEs with poor performance are first privatized (Gupta et al., 2008). Table 5 Columns (2) and (5) show the estimations of the interaction effect of financial deleveraging and government subsidies on privatization. As shown, neither the coefficient for the interaction term of *Del_Dum* and *Subsidy* in Column (2) nor the coefficient for the interaction term of *Debt/GDP* and *Subsidy* in Column (5) is significant. Results in Table 5 Columns (2) and (5) indicate that firms with more government subsidies are not necessarily privatized by the local governments. Table 5 Columns (3) and (6) are the results from estimating model (4) in which we include the interaction term of *Del_Dum* (*Debt/GDP*), *Loss* and *Subsidy*. We notice that the coefficient of *Del_Dum*Loss*Subsidy* in Column (3) is 0.010, which is positive and significant at 5% level. Meanwhile, the coefficient of *Debt/GDP*Loss*Subsidy* in Column (6) is −0.0002, which is negative and significant at 10% level. Overall, results in Table 5 demonstrate that only the SOEs with more losses and more government subsidies can be privatized by the local governments. In other words, during financial deleveraging, the local governments are willing to privatize SOEs only when the SOEs' losses cause financial burden to them. Our evidence is consistent with the findings obtained by D. Li and Lui (2004), which suggest that the heavy debt of a SOE will promote the government to make the

Table 7. Regression results based on substitution of financial deleveraging, Placebo test and IV estimation.

	Privatization				
Variable	(1)	(2)	(3)	(4)	(5)
Del_Dum2	0.570***				
	(3.057)				
M2/GDP		−0.022**			
		(−2.540)			
Del_Dum$_{false}$			−0.396**		
			(−2.293)		
Del_Dum				1.712***	
				(5.145)	
Debt/GDP					−0.103***
					(−24.229)
Constant	3.261	6.815***	6.037**	−6.470***	−1.891**
	(1.210)	(2.758)	(2.369)	(−2.926)	(−2.249)
Control Variables	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES
Pseudo R^2	0.128	0.127	0.126	—	—
Observations	8,485	8,485	8,485	8,485	8,485

decision of privatization when it becomes a major financial burden to the government.

In addition to separately run models (2)–(4), we also run a general model that includes all the variables (*LowTax*, *LowStaff*, *Loss* and *Subsidy*) together to see if these variables have some kind of interaction among themselves. The results are reported in Table 6. As shown in Columns (1) and (3), our main conclusions do not change when we run a general model. That is, local SOEs with less tax contribution, fewer employees and more losses and subsidies have a higher privatization probability during financial deleveraging. However, the coefficients of *Del_Dum***LowTax* (*Debt/GDP***LowTax*) and *Del_Dum***LowStaff* (*Debt/GDP***LowStaff*) are smaller than that in Table 4 while the coefficient of *Del_Dum***Loss***Subsidy* (*Debt/GDP***Loss***Subsidy*) is similar to that in Table 5. Such results indicate that the variables of taxes and employees may have some kind of interaction, but which does not affect the estimate of the correlation among financial deleveraging, tax contribution (scale of employees) and privatization of local SOEs. Columns (2) and (4) report the relative importance (RI)——calculated as the share in explaining dependent variable variance——of each variable, which show that financial burden caused by SOEs is the most important factor that local governments consider when deciding to privatize what types of SOEs. However, The RIs of *LowTax* and *LowStaff* have no significant difference, indicating that taxes and employees are equally important to the governments.

5. Robustness tests

5.1. Substitution of financial deleveraging

First, although credit to private sector scaled by GDP is widely used to measure financial leverage ratio, some literature also adopts M2/GDP as a proxy variable for financial leverage ratio in robust tests. Therefore, we use the HP with a smoothing parameter of 400 to separate the trend and cyclical component in M2/GDP and regenerate the financial deleveraging year dummies, denoted by

Table 8. Regression results that remove the effects of control variables on deleveraging.

Variable	(1) *Privatization*	(2) *Privatization*	(3) *Privatization*	(4) *Privatization*
$Residual_{Del_Dum}$	0.068**	0.065**		
	(2.224)	(2.158)		
$Residual_{Debt/GDP}$			−0.016**	−0.019**
			(−2.077)	(−2.232)
Constant	−3.687***	7.685***	−3.688***	7.834***
	(−47.931)	(3.032)	(−47.770)	(3.105)
Control Variables	NO	YES	NO	YES
Industry FE	NO	YES	NO	YES
Province FE	NO	YES	NO	YES
Pseudo R^2	0.001	0.125	0.001	0.127
Observations	8,485	8,485	8,485	8,485

Del_Dum2. Then, we re-estimate model (1), the result is shown in Table 7 Column (1), we note that the coefficient of *Del_Dum2* is positive and significant at the 1% level. Second, we substitute *M2/GDP* for *Debt/GDP*. The result in Table 7 Column (2) shows that *M2/GDP* correlates negatively with *Privatization*, suggesting an increase in the privatization when the money supply decreases, which is consistent with our main results.

5.2. Placebo test

Because financial deleveraging influences all listed local SOEs, thus we cannot observe the counterfactual situation——privatization of the local SOEs that are not affected by financial deleveraging. To further confirm the robustness of our main results, we perform a placebo test with defining a set of false financial deleveraging years. Specifically, we define 2009 and 2012 – 2016 (they are actually financial leveraging years) as the financial deleveraging years, denoted by Del_Dum_{false}. If the coefficient of Del_Dum_{false} is consistent with that of *Del_Dum* in Table 3 in terms of direction and significance, then we can say that our main results are not robust, and robust otherwise. Table 7 Column (3) indicates that the coefficient of Del_Dum_{false} is −0.396, which is contrast to the results in Table 3. Therefore, our main results hold.

5.3. Endogeneity

Some unobservable factors may influence China's financial deleveraging and privatization of local SOEs at the same time. For example, the capital supply is usually insufficient in bad times, resulting in a decline in the credit to private sector. Meanwhile, the local governments are usually under higher fiscal pressure in bad times, and their willingness to privatize SOEs may increase. To address our concern for endogeneity issue, we employ an instrumental variable probit (IV Probit) approach. We designate the annual average shadow interest rate (*SSR*) in the United States as the instrumental variable for the Chinese financial deleveraging. There are two reasons: First, global factors such as federal shadow interest rate have spillover effects on the monetary policies of emerging market countries (He & McCauley, 2013). It will lead to capital outflow from emerging markets when the US Federal Reserve raises interest rates, and hence financial deleveraging may

Table 9. Regression results based on propensity score and MD matched sample.

	Privatization			
Variable	(1)	(2)	(3)	(4)
Del_Dum	0.744***		0.507**	
	(2.991)		(2.084)	
Debt/GDP		−0.020*		−0.016*
		(−1.959)		(−1.817)
Constant	3.877	7.900***	1.491	4.030
	(1.227)	(2.803)	(0.519)	(1.564)
Control Variables	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Province FE	YES	YES	YES	YES
Pseudo R^2	0.120	0.117	0.095	0.094
Observations	930	930	968	968

happen in these economies. Therefore, the US shadow interest rate meets the correlation requirements of IV. Second, the US shadow interest rate will not directly affect the privatization of local SOEs in China, meeting the exogenous requirements of IV. Table 7 Columns (4) and (5) present the results of IV Probit. As shown, the relationship between *Del_Dum* (*Debt/GDP*) and *Privatization* still exists.[8]

Another endogeneity may be caused by the control variables. That is, the same control variables that have influence on the probability of privatization may also have some effects on the value of the deleveraging decisions taken by China's Central Bank concerning the individual firms. To address such endogeneity issue, we first regress financial deleveraging variables (*Del_Dum* and *Debt/GDP*) on the control variables used in the baseline model, and obtain the residual terms——denoted by $Residual_{Del_Dum}$ and $Residual_{Debt/GDP}$, respectively. Then, we regress *Privatization* on the residual terms ($Residual_{Del_Dum}$ and $Residual_{Debt/GDP}$). Doing so enables us to obtain the net effects of financial deleveraging on privatization because the residual term represents the portion of the deleveraging variable that is not affected by the control variables. Table 8 reports such net effects. As shown, the coefficients of $Residual_{Del_Dum}$ in Columns (1) and (2) are significantly positive, and the coefficients of $Residual_{Debt/GDP}$ in Columns (3) and (4) are significantly negative, indicating that the endogeneity issue caused by the control variables does not change our conclusions.

5.4. Sample selection bias

Given that the local SOEs with certain characteristics may have a high probability of being privatized, which can cause estimation bias, we match the SOEs that are privatized with the SOEs that are not privatized employing the propensity score matching method (PSM). The variables used for matching include strategic industry dummy, ROA over the past two years, number of employees, sales growth, interest-bearing debt ratio and employee productivity. We use one-to-four nearest neighbor matching and the difference between the propensity scores of treatment firms and control firms is no more than 0.005. The results are

[8]The Wald test shows that *Del_Dum* and *Debt/GDP* are endogenous. In addition, *SSR* has strong explanatory power for both *Del_Dum* and *Debt/GDP*. We also conduct a two-stage estimation and find that the F value of the first stage is far more than 10, so there is no weak IV problem.

presented in Table 9 Columns (1) and (2). In addition, we also employ Mahalanobis distance (MD) method to match firms, and the results are reported in Table 9 Columns (3) and (4). As shown, with either matching method, our main results still hold.

5.5. Other robustness tests

China has been confronted with the complex and changeable environment during the long period from 2004 to 2017, our main results may be driven by external shocks or other domestic reforms. Therefore, we attempt to eliminate the impact of some special events. For example, we remove the observations in 2007 and 2008 from our sample to exclude the possible influence of the global financial crisis. In addition, the central government proposed to actively develop a mixed ownership economy at the Eighteen Third Plenary Session in 2013, which may affect the subsequent transfer of state-owned equity. To address this concern, we add the dummy variable *after2013* (1 for the years after 2013, and 0 for other years) in the model (1). The unreported results show that the relationship between *Del_Dum* (*Debt*/*GDP*) and *Privatization* still exists.

6. Conclusions

Privatization is an effective means for China to reform SOEs and establish a market-oriented economy. However, mass and rapid privatization supported by economic liberals is not applicable for transition economies. The success of privatization in large part depends on the perfection of law and the effectiveness of regulation (Estrin et al., 2009). Given that China's legal system is imperfect and protection of investors is weak, it is reasonable for the Chinese government to adopt the gradual privatization strategy. However, with the improvement of China's legal system, the privatization of SOEs in China will continue. In particular, the central government has put forward guidance on the reform of SOEs by classification since 2015, which implies that most of the state-owned capital will be invested in the areas related to the public service, strategic security and vitals of the national economy. Meanwhile, the SOEs will follow the market rules of survival of the fittest and withdraw from the competitive field. Therefore, we need to deeply understand what and how environmental factors affect the local governments' desirability of privatization and the local governments' key concerns in the privatization decision in order to promote the local governments to withdraw their SOEs from the fields that lack competitive advantages.

Using a sample of listed local SOEs in the Chinese A-share market from 2004 to 2017, our paper investigates the influence of financial deleveraging on privatization of local SOEs in China. Our results show that the probability of privatization of local SOEs increases significantly in financial deleveraging years, and the lower the financial leverage ratio, the greater is the possibility of privatization of local SOEs. Therefore, our paper is consistent with the notion that privatization is influenced by environmental factors. In addition, financial deleveraging has heterogeneous effects on privatization across firms. Specifically, the local SOEs with less tax contribution, fewer employees, and that cause greater financial burden to the local governments are more likely to be privatized during

financial deleveraging, suggesting that stabilizing tax revenue, minimizing unemployment and reducing financial burden are important concerns of local governments in the privatization decision.

Our results have two important implications. First, previous literature has explored the impact of environmental factors——such as intensified market competition, tax sharing and banking reform and interregional competition——on Chinese privatization. Consistent with these literatures, we find that macro environment is an important factor affecting the privatization of Chinese local SOEs from the perspective of financial deleveraging. As a result, the willingness of the Chinese local governments to privatize varies in different macro-environments, and the researchers should not only focus on the local government motivations of privatization but also the environmental factors that affect the local government motivations of privatization when they study the causes of Chinese privatization in the future. Second, the Chinese central government can force their local governments to withdraw from fields that lack competitive advantages through appropriate macro policies, and hence promote the reform of local SOEs. However, our results indicate that the Chinese local governments may selectively retain large SOEs that contribute a lot to taxation but are inefficient or even suffer heavy losses to obtain fiscal and political benefit. Therefore, in order to promote more efficient privatization, the Chinese central government should also deepen reform of the fiscal and taxation systems and formulate measures to compensate for the losses caused by efficient privatization to local governments.

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