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State Ownership and Financial Constraints on Investment of Chinese Listed Firms: New Evidence by Lin & Bo

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State Ownership and Financial Constraints on Investment of Chinese Listed Firms: New Evidence

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Abstract

We examine how state ownership affects financial constraints on investment of Chinese listed firms during 1999-2008. We find that although an average sample firm experiences some degree of financial constraints, state ownership does not necessarily help in reducing the firm's financial constraints on investment. Further evidence shows that state ownership does not lead to more borrowing from the Chinese banking sector, implying that state ownership does not necessarily reduce the firm's financial constraints via the state-controlled banking sector. We do not only consider standard factors in the investment equation, but also explicitly control the firm's equity financing behaviour. The results are also robust to different measures of financial constraints. Our results suggest that China's corporatization movement is effective in the sense that the soft budget constraints regime once enjoyed by former State-Owned Enterprises (SOEs) has been removed along with the progress of corporatizating the former SOEs. These firms, although still state–involved, can be seen as modern corporations who are operating in a market environment.

JEL codes: D21, D92, G31, H32.

Key words: Fixed Investment, Financial Constraints, State Ownership, Listed firms, China

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1. Introduction

How state ownership affects the firm's real and financial activities has been drawing a lot of academic attention in the literature. One view concerns that state ownership damages corporate value mainly because government intervention brings about political objectives in corporate decision-making (Shleifer and Vishny 1994; 1998), while the other view argues that state–involved firms are more likely to receive preferential treatment from the government (e.g. Blanchard and Shleifer 2000). Particularly, the impact of state ownership on the financing behaviour of newly corporatized firms in transition economies stands out due to the historical connections between the former State-Owned Enterprises (SOEs) and sources of external financing available to these firms. Many previous researches based on transition firms document that firms that are state-owned in general experience less financial constraints on investment than firms with other types of ownership, such as those privately owned (e.g. Lizal and Svejnar 2002; Mickiewicz, Bishop, and Varblane 2004; Poncet, Steingress, and Vandenbussche 2008; Hericourt and Poncet 2009). This argument is centered on the accessibility of external financing for investment that these firms are able to gain in a transition economy where the state is still intervening in the allocation of capital. Hence the conventional view that state-involved firms are less subject to financial constraints is built upon the notion that in transition economies many banks still remain very much state influenced if not state-owned and these banks are often under government pressure concerning social objectives, such as preserving jobs, to offer state-related firms loans irrespective of their profitability.

Previous studies on Chinese state ownership had focused on the relation between state ownership and the firm's value/performance. The conclusion drawn by this stream of research is mixed: although some authors provide evidence that state ownership negatively affects the firm's value/performance (e.g. Sun and Tong 2003), state ownership is also found to promote firm value/performance under certain circumstances (e.g. Tian and Estrin 2008). Concerning the channels through which state ownership affects firm performance, many researchers claim that the negative effect of state ownership can be attributed to that the firm

is disturbed by the government's political objectives. The most often mentioned political objectives are related to retaining employment for the sake of social stability. Another channel through which state ownership affects firm performance is financing. Although the scale of research on investment financing of Chinese firms is modest, a few studies have found that firms being classified as state-owned are less prone to financial constraints on investment (e.g. Poncet, Steingress, and Vandenbussche 2008; Guariglia, Liu, and Song 2008). This conventional view on the relation between state ownership and the firm's financial constraints can be interpreted either way, i.e. it can be seen to support the notion that state ownership creates firm value since state intervention helps reduce financial pressure of the firm, or it can also be the case that state intervention continues to bring in soft budget constraints to state-involved firms despite of years of market transition, which damages the firm's profitability. In this paper, we provide new evidence on how state ownership affects financial constraints on investment of Chinese firms. Our central conclusion is that state ownership does not necessarily help in reducing financial constraints on investment for the firms that have been listed in China's stock markets. We argue that China's corporatization movement has been effective in the sense that the soft budget constraints regime once enjoyed by former SOEs has been removed along with the progress of corporatizing the former SOEs. These firms, although still state–involved, can be seen as modern corporations who are operating in a market environment.

To be able to provide some new insights on understanding the relation between state ownership and investment financing of Chinese listed firms, we distinguish ourselves from previous studies from the following aspects: Firstly, we exclusively focus on the listed firms with state ownership (the state-involved listed firms hereafter), while previous studies in the same line are mainly based on a mixture of listed and nonlisted firms in which the listed firms constitute only a small portion (e.g. Poncet, Steingress, and Vandenbussche 2008; Guariglia, Liu, and Song 2008).[1] We believe that the impact of state ownership on the firm's financing constraints differs between listed and nonlisted firms. Listed firms are in general larger in size, more profitable, more transparent and have better corporate governance mechanisms.

Listed firms, although still state-involved, are more exposed to market scrutiny hence they have to be more responsive to the market environment than nonlisted firms. One distinguished feature of Chinese listed firms is that the state has been retaining its dominance in many of Chinese listed firms during our sample period of 1999 to 2008, which provides us with an opportunity to examine whether these firms after years of corporatization or partial privatization still enjoy no or less financial constraints as compared to other firms.

Secondly, our empirical analyses are based on an updated dataset covering 1999 to 2008. Previous studies have used the sample period up to 2005 (see Section 3.2. for the related literatures). The year 2005 and beyond is important for Chinese corporate behaviour since the reform of liquidating non-tradable shares took place in 2005, which is expected to improve corporate governance and change the behaviour of the controlling shareholders in Chinese listed firms. Therefore, examining the investment and financing behaviour of Chinese listed firms beyond 2005 will add value to the existing literature.

Thirdly, previous studies in this line have exclusively used the investment–cash flow sensitivity as the proxy for financial constraints on investment the firm faces. Considering the debates on the use of the investment–cash flow sensitivity (see Section 3.1), the results reported by previous studies require robustness check. In this paper we extend the existing studies by adopting an alternative proxy for financial constraints on investment. More specifically, we not only use the conventional measure of financial constraints on investment, namely the investment-cash flow sensitivity, but also apply a recently developed measure of financial constraints, i.e. the KZ index, to test the relation between state ownership and firm's financial constraints on investment.

Fourthly, when examining financial constraints on investment of the firm, we explicitly control for the impact of Seasoned Equity Offerings (SEOs) behaviour of the firm. The firm's equity financing behaviour after its Initial Public Offerings (IPOs) is relevant to the degree of financial constraints the firm faces because SEOs is another main source of external financing apart from bank loans in China. For example, Huang and Song (2006) report that more than 50% of financing of Chinese listed firms come from external sources,

and net equity financing makes up more than 50% of external financing, suggesting that Chinese firms very often use equity financing as a channel to raise external capital. Previous studies on financial constraints of Chinese firms have not taken into account the firm's equity financing behaviour.

Based on a panel of 1325 Chinese listed firms during 1999-2008, we found that although an average listed firm in our sample experiences a certain degree of financial constraints on investment, state ownership does not necessarily help in reducing financial constraints of the firm. We provide evidence that the listed firms either with the state as the largest shareholder or with higher direct state shares do not necessarily face no or less financial constraints. Our results are obtained by using the advanced system GMM estimation technique, which takes account of both endogeneity and heteroscedasticity problems in dynamic panel data models. The result is robust to both the conventional proxy for financial constraints, i.e. the investment-cash flow sensitivity, and a recently developed approach to proxy for financial constraints, i.e. the KZ index. The result is further supported by the evidence that state ownership does not bring in more bank loans to the sample firms, hence state ownership does not necessarily reduce the firm's financial constraints via the state-controlled banking sector. Our result suggests that China's corporatization movement has been effective in the sense that the soft budget constraints regime once enjoyed by former SOEs has been removed along with the progress of corporatizating the former SOEs. These firms, although still state–involved, can be seen as modern corporations who are operating in a market environment.

In the next section, we briefly discuss the evolution of SOEs and the listed firms in China. In Section 3, we first review the standard literatures of financial constraints on investment, after which the relevant literatures in transition economies are evaluated. Section 4 sets up empirical models. Section 5 describes the data and presents summary statistics. Section 6 explains estimation methods. In Section 7 we present the estimation results of using the investment-cash flow sensitivity as a proxy for the firm's financial constraints. Section 8 concerns the estimation results of using the KZ index. Section 9 provides further robustness

results by testing the relation between the firm's borrowing and state ownership. Section 10 concludes.

2. Background of Chinese state-involved listed firms

Our main research objective in this paper is to examine the relationship between state ownership and financial constraints on investment of Chinese listed firms. It is important to first look at the evolution of SOEs in China because the majority of the Chinese listed firms were transformed from former SOEs, and many of them can still be regarded as state-owned depending on various definitions.[2]

Since the early 1990s, China has started its restructuring of large SOEs and about 1400 corporatized SOEs have since issued shares on either the Shanghai stock exchange or Shenzhen stock exchange (Li and Putterman 2008). At the start of the reform, the SOEs only sold about one-third of their equity capital onto the stock markets, with the remaining shares stayed non-tradable held by the state or the state-related legal persons. Not until 2005, transfers of non-tradable shares were only allowed among their holders through irregularly scheduled auctions and over-the-counter transactions. In 2005, the China Securities Regulatory Commission (CSRC) introduced the ownership split reform and the conversion of non-tradable shares into tradable shares became possible. Obviously, the arrangement of non-tradable shares before 2005 was a persistent effort by the government to retain the ownership and financial controls over large SOEs. Even after the 2005 reform, there are still a significant amount of non-tradable shares in the listed firms due to the lock-up period and the restrictions on the amount of non-tradable shares to be sold to the market within a specific period of time. In general, there are still a large proportion of the listed firms remained very much state-controlled or state-involved during our sample period (1999-2008).

Chinese listed firms have gradually established a modern corporate governance system thanks to the corporatization movement. In 1998, Chinese listed firms started formally and regularly to report corporate governance information. Additionally, the institution of Board of Directors was introduced around 2001. Hence it can be seen that the listed firms

have already had a formal corporate governance system in place during our sample period (1999-2008). Evidence shows that Chinese former SOEs have significantly improved their performance after their IPOs (Wei et al. 2003). It has also been documented that investments increased significantly, while debt to assets and long-term debt to equity ratios significantly decreased (Chen, Firth and Rui 2006). In general, while social objective concerns still play a role in corporate decision making, the behaviour of Chinese listed firms, although still state-involved, have been moving towards more profit-oriented. For example, in terms of dwelling houses and welfare facilities investments, Bo, Li, and Toolsema (2009), based on a panel of Chinese firms during 1995-1999, find that although social objectives still dominate profit concerns in SOEs' social welfare investment decisions, the firms have become more and more profit motivated along with the progress of China's transition. The overall implication is that the investment behaviour of Chinese listed firms has been gradually transforming to less driven by government objectives with respect to both real and financing decisions.

As far as sources of investment financing are concerned, in China, other than equity financing, the main source of external finance for listed firms is bank loans since the corporate debt markets were still underdeveloped (Firth, Lin, and Wong 2008). Given the highly regulated banking sector, major banks in China still remain largely state-owned and were until 1998 instructed not to lend to private firms (Poncet, Steingress, and Vandenbussche 2008). However, after 1997, China's policy makers faced serious challenges as well as powerful lessons from neighboring economies that were suffering from the 1997 Asian financial crisis. State banks have tightened their lending standards and began to behave more like commercial banks, and in the meantime, the government became more willing to let ailing SOEs fail (Naughton 2007). The attitude of these banks towards SOEs, particularly to the listed SOEs has since been becoming less obligatory of policy lending. The resulting trend more or less coincides with our finding in this paper that firms having large state ownership presence are not necessarily guaranteed to face less or no financial constraints as previous studies suggested.

3. Literature review of financial constraints on investment

3.1. Standard literatures

Under the assumption of perfect capital markets, the Modigliani-Miller theorem (1958) suggests that the value of a firm is irrelevant of its capital structure. In other words, the investment behaviour of a firm is independent of its financing decisions as internal and external funds are perfect substitutes. Nonetheless, in the presence of capital market imperfections, a firm's investment decisions will be determined by the financial constraints it may be facing. Myers and Majluf (1984) argue that the problem of asymmetric information on the prospects of investment projects between managers and outside investors, under the assumption that managers maximize shareholders' wealth, will lead to adverse selection, and consequently outside investors will demand a premium if they are to invest in the firm. Therefore, there is a perceived wedge between the costs of internal and external funds stemmed from informational and contracting problems (Greenwald, Stiglitz, and Weiss, 1984; Myers and Majluf, 1984). Consequently, firms will forgo some investments with positive net present value because the cost of financing such investments using external funds is too high, and as a result it would lead to underinvestment.

Empirical test of financial constraints on investment was pioneered by Fazzari, Hubbard, and Petersen (1988) (thereafter FHP), in which the authors incorporate cash flow as a measure of internal fund in a Q-model of investment and use a priori classification of firms based on the firm's dividend payout ratio. FHP (1988) document that firms with low dividend payout, which are believed to be potentially more financially constrained, exhibit a high sensitivity of investment to cash flow. This investment sensitivity of cash flow is interpreted as evidence of financial constraints on investment. Following FHP (1988), similar studies appeared in this stream of researches on the investment-cash flow sensitivity as an indication of financial constraints. For instance, Hoshi, Kashyap and Scharfstein (1991) find that firms affiliated with *keiretsu* (industrial groups) in Japan have weaker sensitivity of investment to liquidity measures, and argue that these firms face less financial constraints because of their close relationship with the main banks inside *keiretsu* that reduces the problem of asymmetric

information. Devereux and Schiantarelli (1990) find that cash flow is a more important factor in investment for younger firms than for older firms based on a sample of 720 UK manufacturing firms during 1969-1986. They postulate that this is because information asymmetries are likely to be severer for younger firms. Overall, evidence from these empirical studies has suggested that for firms considered a priori to be more (less) financially constrained are found to have stronger (weaker) sensitivity of investment to cash flow-type variables.

Nevertheless, taking a significant correlation between investment and internal funds or most commonly the investment-cash flow sensitivity as an indication of financial constraints on investment is not without criticism. In an in-depth study on the sample firms used by FHP (1988), Kaplan and Zingales (1997) (thereafter KZ) argue that the firms identified as financially constrained in FHP (1988) are actually not constrained at all. They find that firms taken to be less financially constrained by FHP's (1988) in fact have significantly higher investment-cash flow sensitivity than firms appeared to be more constrained. KZ (1997) challenged that firms having higher investment-cash flow sensitivity cannot be taken as evidence of being more financially constrained. In response to KZ (1997), Fazzari, Hubbard, and Petersen (2000) in turn criticized the theoretical model adopted by KZ (1997). The debate on whether the investment-cash flow sensitivity is a good proxy for financial constraints on investment remained inconclusive. Nevertheless, more recent papers have offered further supporting views on the use of the investment-cash flow sensitivity as an indication of financial constraints. For example, Allayannis and Muzomdar (2004) argue that the findings from KZ (1997) are a result of the inclusion of firms in distress defined by negative cash flow observations as well as a few influential observations in a small sample. In addition, Chirinko and Kalckreuth (2003) also find evidence consistent with FHP (1988) that firms that are financially constrained as identified by their creditworthiness, exhibit higher investment-cash flow sensitivities.

In this paper, we not only use the conventional measure of financial constraints on investment, namely the investment-cash flow sensitivity, but also the recently developed KZ

index of financial constraints to test the relation between state ownership and firm's financial constraints on investment. We will discuss the KZ index in detail in Section 7.

3.2. Relevant literatures in transition economies

In line with the standard literature of financial constraints on investment, a few studies have touched on the issue of the investment behaviour of privatized or corporatized former SOEs in transition economies. For example, Lizal and Svejnar (2002) using quarterly panel data on industrial firms in Czech Republic find that SOEs and former SOEs were less profitable and received more bank credits. Their results show that during the transition period these firms invested at a higher rate than more profitable counterparts and operated under the soft budget constraint as indicated by insignificant coefficients on profit in the investment equation. In the case of China, Poncet, Steingress, and Vandenbussche (2008) argue the presence of "political-pecking order" in credit allocation in Chinese firms. With a dataset of more than 20,000 firms in China during the period of 1998-2005, they classified the firms into different groups according to their types of ownership. The categories include private firms, SOEs, collective owned enterprises (COEs), and foreign invested enterprises, where a firm is classified as an SOE if the state owns either directly or indirectly more than 25 percent of the shares. In their regression estimations, they also considered COEs as SOEs, because of COEs' direct association with local governments, and pooled them together in the estimations. Based on separate estimations for each subgroup by Ordinary Least Squares (OLS), Instrumental Variables (IV) and Fixed Effect estimators and using cash flow as a proxy for internal finance in their investment equations, they find insignificant coefficients for cash flow for SOEs and foreign invested firms but positive and significant coefficients for cash flow for private firms. Poncet, Steingress, and Vandenbussche (2008) argue that their results indicate that while private firms in China face sever financial constraints on their capital investments, SOEs (defined in their way) and foreign invested firms do not face such constraints. Guariglia, Liu, and Song (2008) obtain similar results base on 407,096 mainly unlisted firms over the period of 2000-2005. Using a dynamic assets growth model augmented with cash flow as a proxy for

internal finance and based on subsample groups classified by the firm's largest shareholder. In this paper, firms were also classified into the same 4 groups as in Poncet, Steingress, and Vandenbussche (2008), but with different criteria. For example, firms with legal persons or individuals as the largest shareholder are classified as private firms. SOEs are firms with the state being the largest shareholder. They report that SOEs' total assets growth, which encompasses firm investment, is not affected by cash flow. Again, their finding suggests that SOEs are not bounded by financial constraints, as stated by Guariglia, Liu, and Song (2008) that "probably because of the important role they (SOEs) play in absorbing surplus labor and helping to maintain social stability, which guarantees them unlimited loans from the state banks".

Firth, Lin, and Wong (2008) examine how state ownership affects the monitoring and disciplinary effect of leverage on investment with a sample of 1203 Chinese listed firms during the period of 1991 to 2004. Using fixed effect and instrument variable estimations, they find that the firms in their sample with a higher percentage of state ownership, defined by the sum of state shares and state-owned legal person shares, have a weaker negative relation between leverage and investment, suggesting a weaker monitoring role of debt in the firm with higher state ownership. They argue that the lending policy of state-owned banks in China is more lenient towards firms with greater state shareholding than those with smaller state shareholding.

In sum, previous studies have found that firms with large state ownership in transition economies are not or less subject to financial constraints and these firms may still enjoy some degree of soft budget constraint thanks to the state's social objectives. However, as we mentioned earlier, three important factors are important to mention in evaluating previous studies. Firstly, the datasets used in previous studies usually have not exclusively focused on the listed firms, and even if these firms were included, they only formed a very small part in the samples. The findings of these studies may be restricted to traditional state-owned firms in China as opposed to former SOEs that made to be corporatized. Secondly, these previous studies have exclusively relied on the investment–cash flow sensitivity as the proxy for

financial constraints the firm faces. Considering the debates on the use of the investment–cash flow sensitivity (see Section 3.1), the results reported by these studies require robustness test. Thirdly, previous studies have not controlled for the firm's seasoned equity financing behaviour when examining financial constraints of the firm. Finally, as we can see that the sample period in the previous studies does not cover the period after 2005 when the reform of liquidating non-tradable shares took place.

4. Empirical specifications

In a benchmark investment equation, we combine the accelerator type investment model and the Q-model of investment. Market based variables such as Tobin's Q may be problematic since the stock markets in mainland China are still not very well developed and the changes in stock prices may not truly reflect the changes of a firm's fundamental value, thus we use both sales growth rate and Tobin's Q to capture investment fundamentals. We also include the lagged term of investment to take into account the dynamic nature of investment. The benchmark empirical investment equation is:

$$\left(\frac{I}{K}\right)_{i,t} = \beta_1\left(\frac{I}{K}\right)_{i,t-1} + \beta_2 Sales_{i,t-1} + \beta_3 Q_{i,t-1} + \beta_4\left(\frac{CF}{K}\right)_{i,t-1} + \beta_5\left(\frac{D}{K}\right)_{i,t-1} + \beta_6 State_{i,t-1} + \beta_7 Size_{i,t-1} + \beta_8 SEO_{i,t-1} + f_i + f_t + \varepsilon_{i,t} \quad (1)$$

The subscript *i* identifies individual firms, and the subscript *t* represents current year. Investment, *I,* is measured as the fixed assets for current year minus the fixed assets for previous year plus depreciation; *K* is the total assets as a proxy for the level of capital stock. *Sales* is the annual growth rate of sales used to capture the accelerator effect. *Q* is Tobin's *Q*, representing the firms' further investment opportunities. Taking into account the non-tradable shares in Chinese listed firms, Tobin's *Q* in this paper is calculated as the sum of the year-end market value of tradable shares, book value of non-tradable shares, book value long-term and short-term debts, divided by the year-end total assets. The value of non-tradable shares is the product of the ratio of non-tradable shares to total shares and the book value of the firm's net

assets. The key variable in empirical model (1) is cash flow scaled by total assets of the firm, *CF/K*, where *CF* denotes cash flow and is the net profit plus depreciation. The estimated coefficient for *CF/K* represents the investment-cash flow sensitivity, which is commonly used in the literature as a measure of financial constraints. A positive and statistically significant coefficient for *CF/K* would present the existence of financial constraints on investment. The leverage variable, *D/K*, is the ratio of total debt to total assets, which is included to control for the effect of borrowing on investment. *State* is the ratio of shares held by the state to total shares of the firm, where state share includes both the shares held by the central government and the shares held by the government related legal persons. *Size* is firm size, measured by the natural logarithm of the firm's total assets. In addition, to control for the effect of equity financing, we construct a dummy variable for the firm, *SEO*, which takes the value of one if the firm has conducted Seasoned Equity Offerings (SEOs) in the sample period, and zero otherwise. Considering that current investment decision-making is based on past information, we use the observations lagged one period (t-1) for all explanatory variables on the right hand side in equation (1). f_i and f_t are time effects and firm effects, respectively. $\varepsilon_{i,t}$ is the error term.

Our main objective is to check whether the listed firms having a larger presence of state ownership face lesser degree of financial constraints on investment. Following a similar methodology in Firth, Lin, and Wong (2008), we test the effect of state ownership on the investment-cash flow sensitivity by adding an interactive term between cash flow and a measure of state ownership. We first use a dummy variable *DState* that equals one if the largest shareholder of the firm is the state. Later we also use the ratio of state shares *State* to check the robustness. We believe that by adding an interactive term in our estimation rather than splitting firms into subsamples, we exploit the continuous nature of shareholdings data as our dataset shows that transfers of state-owned shares occurred fairly frequently during the sample period. The investment equation with the interactive term between cash flow and the state ownership dummy is:

$$\left(\frac{I}{K}\right)_{it} = \beta_1\left(\frac{I}{K}\right)_{i,t-1} + \beta_2 Sales_{i,t-1} + \beta_3 Q_{i,t-1} + \beta_4\left(\frac{CF}{K}\right)_{i,t-1} + \beta_5\left(\frac{CF}{K}\right)_{i,t-1} \times DState_{i,t-1}$$
$$+ \beta_6\left(\frac{D}{K}\right)_{i,t-1} + \beta_7 State_{i,t-1} + \beta_8 Size_{i,t-1} + \beta_9 SEO_{i,t-1} + f_i + f_t + \varepsilon_{it} \quad (2)$$

To check the robustness, we replace the state ownership dummy in the interactive term in the empirical model (2) with the state ownership ratio. This is to test the effect of having higher ratio of state shareholding on firms' financial constraints on investment. The estimation equation is then:

$$\left(\frac{I}{K}\right)_{it} = \beta_1\left(\frac{I}{K}\right)_{i,t-1} + \beta_2 Sales_{i,t-1} + \beta_3 Q_{i,t-1} + \beta_4\left(\frac{CF}{K}\right)_{i,t-1} + \beta_5\left(\frac{CF}{K}\right)_{i,t-1} \times State_{i,t-1}$$
$$+ \beta_6 State_{i,t-1} + \beta_7\left(\frac{D}{K}\right)_{i,t-1} + \beta_8 Size_{i,t-1} + \beta_9 SEO_{i,t-1} + f_i + f_t + \varepsilon_{it} \quad (3)$$

5. Data and Descriptive Statistics

The balance sheet and income statement variables used in this study are obtained from *Sinofin*, a financial information service company established by China Center for Economic Research (CCER) at Peking University. The ownership structure data are obtained from the GTA Research Service Center in Shenzhen. Our dataset contains 1325 non-financial firms that are listed on either the Shanghai Stock Exchange or the Shenzhen Stock Exchange. Firms in the financial service sector are not included in the dataset since they have rather different investment behaviour, and by excluding them the sample is more homogenous. Moreover, we drop some observations with extreme values since they appear to be obvious outliers. Firms with only three years or less of time-series data are also dropped as sufficient observations over time are needed for the system GMM estimation. The dataset covers observations from 1999 to 2008, in which 819 firms have annual data for the full period, 129 firms have annual data for 2000-2008, 79 firms have annual data for 2001-2008, 72 firms have annual data for 2002-2008, 66 firms have annual data for 2003-2008, 99 firms have annual data for 2004-

2008, and 61 firms have other distribution patterns. For the industry distribution, there are 7029 observations in the manufacturing sector, 908 observations in the wholesale and retail sector, 711 observations in the information technology sector, 516 observations in the electric power, gas and water production and supply sector, 493 observations in the real estate sector, 493 observations in the transport and storage sector, 309 observations in the agriculture, forestry, livestock farming and fishery sector, 226 observations in the construction sector, 171 observations in the mining sector, 108 observations in the communication and cultural industry, and 778 observations in other industries. The final unbalanced panel consists of 11,742 firm-year observations.

Table 1a presents summary statistics for the whole sample. The average ratio of investment to total assets is 0.1413. The average Tobin's Q is 0.7044. The mean ratio of cash flow to total assets is 0.1351. The average ratio of state ownership is about 32%, which confirms the notion of significant presence of state ownership in Chinese listed firms. The mean sales growth rate is 24.41%, which indicates strong growth opportunities in China during the sample period. The average total debt to total assets ratio is 0.5517, implying Chinese listed firms' high dependency on loans. Finally, the majority of the sample firms have used equity financing (SEO =1) during the sample period.

From table 1b and 1c, we can see that firms with the state as the largest shareholder have higher average ratio of investment to total assets, 0.1971 as compared to firms in which the state is not the largest shareholder (0.1099). In addition, firms with the state as the largest shareholder seem to be more capable of generating internal funds, with average cash flow to total assets ratio of 0.1866 as compared to their counterparts (0.1050). This may be due to the fact that most firms, which are still largely retained by the state, operate in key strategic sectors and still enjoy their monopolistic position. The mean sales growth rate is also higher for firms that have greater state influence, with 26.08% as compared to their counterparts (23.47%). The average Tobin's Q is also higher for firms with the state as the largest shareholder. Interestingly, the average total debt to total assets ratio is higher for non-state-controlled firms.[3]

6. Estimation Method

Given that the investment behavior of firms is affected by profitability and hence a firm's cash flow, and in response a firm's profitability or cash flow may also be influenced by its investment decisions, endogeneity problems are very likely to arise in the investment equation. Moreover, considering the dynamic nature of the investment relationship, the presence of the unobserved individual firm fixed effects, the possibility that some explanatory variables are endogenous, and a short unbalanced panel, the system Generalized Method of Moments (GMM) estimator developed by Blundell and Bond (1998) is employed to estimate the investment equations. We choose to use system GMM estimator instead of the first-differenced GMM estimator because first-differenced GMM estimator has been found to produce unsatisfactory results particularly in the case of a large sample of firms observed over a small period of time (Mairesse and Hall 1996). Blundell and Bond (1998) argue that the poor results may be due to weak instruments sets generated from the variables' highly persistent time series and therefore that the lagged levels are only weakly correlated with subsequent first differences, which can result in large finite sample biases.

We use xtabond2 created by Roodman (2009) in *Stata* to conduct the system GMM estimations for our sample. In the estimations we include time dummies to control for macroeconomic effects, and in addition, industry dummies are added to control for industry effects. We use lagged observations of the variables on the right-hand side of the equations as instruments for the first differenced equations. For levels equations, we use lagged differences of variables on the right-hand side of the equations as instruments. We use two-step estimator rather than one-step estimator since it provides with more efficiency (Windmeijer, 2005).

7. Estimation results using the investment-cash flow sensitivity as a proxy for financial constraints on investment

The system GMM results of estimating the empirical models (1)-(3) are presented in Table 2. We first look at the model performance for our GMM estimations, namely the Arellano-Bond

test for autocorrelation in first-differenced errors and the test of overidentifying restrictions, after which we discuss the parameter estimates.

The Arellano-Bond tests for serial correlation in the first-differenced errors at first order and second order are reported as m1 and m2 in Table 2. One important assumption for the GMM estimator is that it requires no autocorrelation in the idiosyncratic errors, and it is commonly reported that if the differenced errors show significantly negative at order 1 and no significance at order 2, then no serial correlation in the errors can be concluded. The test outputs in Table 2 show strong evidence against the null hypothesis of no serial correlation in the first-differenced errors at order 1 as the p values for m1 test in all estimations are zero (less than 0.05). For the m2 test of serial correlation at order 2, the results present no significant evidence of second order serial correlation in the first-differenced errors since all the p values are greater than 0.05. Therefore the null hypothesis of no second order autocorrelation cannot be rejected. The overall test result on autocorrelation implies that there is no model misspecification problem for our estimations. Another important criterion to examine the model performance in the dynamic system GMM estimation is the Hansen test of overidentifying restrictions. This test checks the validity of instruments used in the estimation. As shown in Table 2, the Hansen test results for our estimations provide no evidence that the null hypothesis of valid overidentifying restrictions can be rejected. All in all, the outputs of these tests suggest that our models are correctly specified and the instruments employed are valid.

Now turn to the parameter estimates shown in Table 2, the estimated coefficient for the lagged investment is positive and statistically significant in all the estimated equations of Table 2, confirming the dynamic nature of firm investment. The estimated coefficient for sales growth turns out to be insignificant. However, the estimated coefficient for Tobin's Q is positive and significant, which is consistent with the prediction of the Q-model of investment.

The estimated coefficient for cash flow is positively significant in all estimations in Table 2, which suggests that an average firm in our sample faces a certain degree of financial constraints on investment. Regarding to the control variables, the estimated coefficient for

debt appeared to be negative and statistically significant in all three estimations in Table 2. This finding is in accordance with the empirical results from Firth, Lin, and Wong (2008) who also find a negative relation between investment and leverage. The negative sign implies the disciplinary and monitoring role of debt on firm's investment (overinvestment) since debt obligates firms to pay interests and the principal, which limits the manager's discretion power in spending. The estimated coefficients for the state share ratio turn out to be negative but only statistically significant in the second estimation equation. The coefficient on firm size is negative and significant in all estimations in Table 2. Interestingly, the estimated coefficient for the equity financing dummy, *SEO*, is positive and significant in all three estimations. This result suggests that firms made seasoned equity offerings have a tendency to invest more. The significance result concerning the estimated effect of the SEO dummy supports our argument that the firm's equity financing behaviour should be explicitly considered when financial constraints on investment of the firm is examined.

What is more important for the purpose of the paper is the estimated coefficient for the interactive term between cash flow and state ownership. As it can be seen from model (2) in Table 2, the estimated coefficient for the interactive term between cash flow and the state ownership dummy is positively significant. This surprising result shows that financial constraints on investment actually aggravate for firms with the state as the largest shareholder. If the firms having the state as the largest shareholder experience less financial constraints, we would expect the interactive term to be negatively significant. For model (3) in Table 3, again the estimated coefficient for the interactive term between cash flow and the state ownership ratio has shown to be positively significant. This result is important for us since it shows that having higher ratio of state ownership actually increases (rather than reduces) the extent to which the firm is financially constrained. This finding is in contrast with previous studies concluding that firms with large presence of state ownership experience less or no financial constraints. However, different from previous studies using large samples that include mainly unlisted firms in China (e.g. Guariglia, Liu, and Song 2008; Poncet, Steingress, and Vandenbussche 2008), we have focused on only the listed state-involved

firms that are generically different from those not yet being made public. Moreover, we investigate these state-involved listed firms based on an undated dataset from 1999-2008. Our data covers the period beyond the year 2005 when the reform of liquidating non-tradable shares took place in China, which is important to improve corporate governance of Chinese listed firms. In addition, we include a seasoned equity-offerings dummy (*SEO*) in the investment equation to control for the impact of equity financing on the financial condition of the firm, which has not been considered in previous studies. In sum, our result suggests that state ownership does not necessarily help in reducing financial constraints on investment for the state-involved listed firms.

8. Test of financial constraints on investment using the KZ index

Considering the debates on the use of the investment-cash flow sensitivity as a proxy for financial constraints (see Section 3.1), in this section we provide a robustness test on the results shown in Section 7 by following an alternative approach to measuring the firm's financial constrains.

The KZ index of financial constraints was first developed by Lamont, Polk, and Saa-Requejo (2001) based on Kaplan and Zingales's (1997)'s in-depth study of FHP's sample of low dividend payout firms. After carefully examining these firms, KZ (1997) classified the firm-year observations in the sample into five groups, each of which was assigned a categorical variable to indicate the degree of financial constraints. They then check which accounting variables have contributed to the degree of financial constraints by regressing this categorical variable (degree of financial constraints) against various accounting variables. KZ (1997) found that among other variables, five accounting variables are important in affecting the firm's financial constraints. They are cash flow, Tobin's Q, debt, dividends and cash holdings. The estimated coefficients for these five variables are then able to capture the importance of these variables in explaining the degree of financial constraints the firm faces. Lamont, Polk, and Saa-Requejo (2001) apply the estimated coefficients for the five variables

obtained by KZ's (1997) to their own sample in order to construct an index to proxy for the level of financial constraints for the firm. The construction of the KZ index is as follows.

$$KZ_{i,t} = -1.002 \times \frac{CF_{i,t}}{K_{it-1}} + 0.283 \times Q_{i,t} + 3.139 \times Debt_{i,t} - 39.368 \times \frac{Dividends_{i,t}}{K_{i,t-1}} - 1.315 \times \frac{Cash_{i,t}}{K_{i,t-1}} \quad (4)$$

KZ is the KZ index for each individual firm at time t, and the higher the KZ index, the greater the financial constraints faced by the firm. *CF* is the cash flow, *K* the total assets, *Q* the Tobin's Q, *Debt* the ratio of total debt to total assets, and *Cash* is the amount of liquidity. Applying the same practice, we construct the KZ index for our sample.[4] As a result, we obtain the KZ index for each firm-year observation. The average value of the KZ index for the sample firms is 1.25 with a standard deviation of 1.78.

We then regress the KZ index on state ownership to check if there is any association between the two using the fixed effect estimation. Moreover, we also control for firm size in the estimations since size can be a very important determinant for financial constraints on investment, and it is not contained in the construction of the KZ index. The estimation equation is:

$$KZ_{it} = \beta_0 + \beta_1 State_{it} + \beta_2 Size_{it} + f_i + f_t + \varepsilon_{it} \quad (5)$$

State stands for state ownership, which we use either a dummy variable that equals one if the firm has the state as the largest shareholder or the ratio of state shares. *Size* is firm size, measured by the natural logarithm of the firm's total assets. f_t is the time effect, f_i is fixed effect, , and ε_{it} is the error term.

The results of estimating empirical model (5) are presented in Table 3. As we can see, the estimated coefficient for the state ownership dummy is positive but statistically insignificant. However, the estimated coefficient for the state ownership ratio is positive and statistically significant. This shows that the firm having greater state ownership has a higher value of the KZ index, which implies that the listed firms with greater state involvement

(higher ratio of state shareholding) face greater degree of financial constraints than firms with smaller state shareholding, confirming the results we obtained in model (3) of Table 2 that state ownership does not help in reducing the firm's financial constraints. In addition, the estimated coefficient for firm size is negatively significant in both estimations in Table 3, suggesting that larger firms are in general associated with less financial constraints on investment.

To summarize, the test using the KZ index provides us with further evidence that listed firms with higher degree of state involvement do not necessarily experience less or no financial constraints on investment, confirming the result we obtained by using the investment-cash flow sensitivity as a proxy for the firm's financial constraints.

9. Further robustness tests: the relation between borrowing and state ownership

Both Table 2 and Table 3 provide some evidence that state ownership does not necessarily help in reducing the firm's financial constrains on investment. In this section we further test the robustness of this result by checking the relation between the firm's borrowing and state ownership. The logic is if the state-involved listed firms have received preferential treatment from the state-controlled banking system, then the firm should have more access to external borrowing from the banking sector, implying a less degree of financial constraints on investment. Since Chinese listed firms mainly borrow from banks due to underdeveloped corporate debt market in China, we can set up a borrowing equation to check whether the listed state-involved firms receive preferential treatment from state-controlled banks. More specifically, we regress the firm's total debt (scaled by total assets) on either the state ownership dummy or the state ownership ratio after controlling for other standard variables that determine the firm's borrowing. The estimation equation is as follows:

$$\left(\frac{D}{K}\right)_{it} = \beta_1\left(\frac{D}{K}\right)_{i,t-1} + \beta_2 Sales_{i,t-1} + \beta_3 Size_{i,t-1} + \beta_4 Q_{i,t-1} + \beta_5 ROA_{i,t-1} + \beta_6 State_{i,t-1} + \beta_9 SEO_{i,t-1} + f_i + f_t + \varepsilon_{it} \quad (6)$$

Where *K* is total assets, *D* stands for total debt, *Sales* is the annual growth rate of sales, *Size* stands for firm size, *Q* is the Tobin's Q, *ROA* is the return on asset, measured as net profit divided by total assets, *State* refers to state ownership (either a dummy or the state share ratio), and *SEO* is a dummy that equals one if the firms has made seasoned equity offerings in the sample period. The control variables used in the estimations are the common determinants of leverage in the literature. For example, sales growth rate captures the firm's growth potential and higher growth rate leads to greater demand for borrowing. Size is also an important determinant for leverage. Larger firms tend to be more diversified and less likely to go bankrupt; therefore large firms should be able to borrow more in general (Titman and Wessels 1988). However, it could also be the case that since it is more expensive for small firms to issue new equity than debt, small firms are more prone to borrow through bank loans (Smith 1977). Both Tobin's Q and return on assets indicate profitability and ability to generate fund. Increase in these variables should lead to less reliance on borrowing. Moreover, the firm that has conducted secondary equity offerings may have a tendency to borrow less because the demand for investment financing can be partially met buy issuing equity from the stock market.

The results of estimating model (6) using system GMM are shown in Table 4. The estimated coefficients for both return on assets and size are statistically significant with a positive sign. Firm size has a positive sign, which is consistent with Titman and Wessels (1988). The estimated coefficient for the SEO dummy is negatively significant, which coincides with our conjecture that firms that have conducted SEOs borrow less. More importantly, the estimated coefficients for both the state ownership dummy and the state ownership ratio are positive but statistically insignificant, which suggests that state firms or firms having higher ratio of state shareholding do not necessarily borrow more from banks. This result implies that state-involved listed firms do not necessarily have more access to bank loans from the state-controlled banking sector.

The overall result in this section suggests that the state–involved listed firms do not borrow more from banks because of stronger state involvement in the firm. This may be explained by that the state banks in China have already become quasi-commercial banks themselves and started to act indiscriminately towards all firms disregard of state involvements in them or not. An in-depth understanding on the lending behaviour of state-controlled banks in China is beyond the scope of the current paper, but the estimation results shown in Table 4 provide further evidence in support of our main result in Tables 2 and 3 that state ownership does not necessarily help in reducing the firm's financial constraints on investment.

10. Conclusions

In this paper we examine how state ownership affects financial constraints on investment of Chinese listed firms during 1999-2008. We first confirm that the investment-cash flow sensitivity is present for Chinese listed firms, suggesting that an average firm in our sample suffers from a certain degree of financial constraints on investment. However, although an average listed firm in our sample experiences some degree of financial constraints, state ownership does not necessarily help in reducing the financial constraints of the firm. We provide evidence that the listed firms either with the state as the largest shareholder or with higher state shareholding do not necessarily face less or no financial constraints, contrasting with previous studies in this line. Our findings are based not only on the conventional proxy for financial constraints, i.e. the investment-cash flow sensitivity, but also on a recently developed approach to proxy for financial constraint, i.e. the KZ index. The result is further supported by the evidence that state ownership does not bring in more bank loans for the sample firms, hence state ownership does not reduce the firm's financial constraints via state-controlled banking sector. Our result suggests that China's corporatization movement is effective in the sense that the soft budget constraints regime once enjoyed by former SOEs has been removed along with the progress of corporatizating the former SOEs. These firms, although still state–involved, can be seen as modern corporations who are operating in a

market environment. However, it would be interesting to examine the effect of state ownership on the firm's real and financial activities during the recent global financial crisis, which has been put on our future research agenda.

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Table 1a: Summary statistics

Variable	N	Mean	Median	Standard Deviation	Minimum	Maximum
(I/K)	11164	0.1413	0.1170	0.1813	-1.327	1.5514
Q	11737	0.7044	0.7556	0.4590	0.0001	18.141
(CF/K)	11689	0.1351	0.1158	0.1776	-1.9587	1.8006
State	11741	0.3199	0.3434	0.2540	0	0.9712
Size	11739	21.1699	21.0725	1.0637	14.1082	27.3463
Sales	11104	0.2441	0.1383	0.9189	-1.733	20.902
Leverage	11732	0.5517	0.4934	0.6897	0	20.2467
SEO	11742	0.5347	1	0.4988	0	1

Notes:
Explanation of variables:
(I/K): ratio of investment to total assets
Q: Tobin's Q
(CF/K): ratio of cash flow to total assets
State: ratio of direct shareholding by the state
Size: natural logarithm of total assets
Sales: annual growth rate of sales
Leverage: ratio of total debt to total assets
SEO: Seasoned Equity Offering during sample years, = 1 if yes

Table 1b: Observations with the state as the largest shareholder

Variable	N	Mean	Median	Standard Deviation	Minimum	Maximum
(I/K)	4018	0.1972	0.1691	0.1918	-1.2577	1.5514
Q	4305	0.7300	0.7896	0.3935	0.0001	16.005
(CF/K)	4303	0.1866	0.1605	0.1755	-1.555	1.3229
State	4308	0.5927	0.5907	0.0986	0.3462	0.9712
Size	4308	21.3654	21.2189	1.0979	17.1171	27.3463
Sales	4007	0.2608	0.1543	0.8637	-0.9999	20.902
Leverage	4304	0.4833	0.4596	0.3705	0.0247	12.3173
SEO	4308	0.5225	1	0.4996	0	1

Table 1c: Observations without the state as the largest shareholder

Variable	N	Mean	Median	Standard Deviation	Minimum	Maximum
(I/K)	7146	0.1099	0.0906	0.1671	-1.327	1.5356
Q	7432	0.6896	0.7317	0.4924	0.0001	18.141
(CF/K)	7386	0.1050	0.0937	0.1718	-1.9587	1.8006
State	7433	0.1618	0.1059	0.1678	0	0.5
Size	7431	21.0566	20.9971	1.0265	14.1082	26.0217
Sales	7097	0.2347	0.1282	0.9486	-1.733	19.6934
Leverage	7428	0.5913	0.511	0.8170	0	20.2467
SEO	7434	0.5417	1	0.4983	0	1

Notes:
Explanation of variables:

(I/K): ratio of investment to total assets
Q: Tobin's Q
(CF/K): ratio of cash flow to total assets
State: ratio of direct shareholding by the state
Size: natural logarithm of total assets
Sales: annual growth rate of sales
Leverage: ratio of total debt to total assets
SEO: Seasoned Equity Offering during sample years, = 1 if yes

Table 2: System GMM estimation results using the investment-cash flow sensitivity

	(1)	(2)	(3)
$\left(\frac{I}{K}\right)_{i,t-1}$	0.351*	0.255**	0.246*
	(1.68)	(2.06)	(1.65)
$Sales_{i,t-1}$	0.051	0.035	0.020
	(1.45)	(0.91)	(0.66)
$Q_{i,t-1}$	0.174*	0.096*	0.115**
	(1.84)	(1.75)	(2.02)
$\left(\frac{CF}{K}\right)_{i,t-1}$	0.344*	0.278**	0.260*
	(1.81)	(2.14)	(1.88)
$\left(\frac{D}{K}\right)_{i,t-1}$	-0.101**	-0.065**	-0.073**
	(-2.24)	(-2.00)	(-2.25)
$\left(\frac{CF}{K}\right)_{i,t-1} \times Dstate_{i,t-1}$		0.223**	
		(2.52)	
$\left(\frac{CF}{K}\right)_{i,t-1} \times State_{i,t-1}$			0.368*
			(1.73)
$State_{i,t-1}$	-0.005	-0.105**	-0.082
	(-0.11)	(-2.07)	(-1.24)
$Size_{i,t-1}$	-0.053**	-0.039*	-0.039**
	(-2.14)	(-1.67)	(-2.03)
$SEO_{i,t-1}$	0.132*	0.071*	0.079**
	(1.91)	(1.69)	(1.98)
m1	-4.88	-7.00	-6.21
(p value)	[0.000]	[0.000]	[0.000]
m2	0.94	0.91	0.99
(p value)	[0.349]	[0.362]	[0.322]
Hansen test	15.72	33.93	30.77
(p value)	[0.830]	[0. 423]	[0.327]
Number of observations	9740	9740	9740
Number of firms	1324	1324	1324

Notes:

(1) Dependent variable: the ratio of investment to total assets $(I/K)_{i,t}$

(2) Time-specific effects are controlled in all estimations by adding year dummies. Industry effects are also controlled in all estimations by adding industry dummies

(3) z-statistics are reported in the parentheses.

(4) Hansen test of overidentifying restrictions is asymptotically distributed as chi-square under the null of instrument validity.
(5) * significant at 10% level; ** significant at 5% level; *** significant at 1% level.
(6) See notes to Table 1 for explanations of variables.

Table 3: The relation between the KZ index and state ownership (fixed effect estimation with robust standard error)

Variable	(1)	(2)
State Dummy	0.026 (0.44)	
State Shares Ratio		0.256* (1.68)
Size	-0.550** (-2.72)	-0.552** (-2.73)
Constant	14.744** (2.75)	12.730** (2.98)
Observations	11672	11671
Firms	1325	1325
R^2	0.187	0.188

Notes:

(1) Dependent variable: KZ index
(2) t-statistics are reported in the parentheses.
(3) * significant at 10% level; ** significant at 5% level; *** significant at 1% level.
(4) See notes to Table 1 for explanations of variables.

Table 4: System GMM estimations results: the relation between the firm's borrowing and state ownership

Variable	(1)	(2)
$\left(\frac{D}{K}\right)_{i,t-1}$	0.990***	0.987***
	(6.87)	(7.25)
$Sales_{i,t-1}$	0.085	0.090
	(1.13)	(1.04)
$Size_{i,t-1}$	0.053***	0.054**
	(2.11)	(3.17)
$Q_{i,t-1}$	-0.386*	-0.365
	(-1.66)	(-1.51)
$ROA_{i,t-1}$	-2.443***	-2.403**
	(-3.02)	(-3.35)
$Dstate_{i,t-1}$	0.009	
	(0.22)	
$State_{i,t-1}$		0.020
		(0.62)
$SEO_{i,t-1}$	-0.091**	-0.083*
	(-2.31)	(-1.85)
m1	-3.89	-3.79
(p value)	(0.000)	(0.000)
m2	0.90	0.86
(p value)	(0.370)	(0.392)
Hansen test	166.08	190.06
(p value)	(0.673)	(0.307)
Number of observations	9777	9777
Number of firms	1324	1324

Notes:
(1) Dependent variable: the ratio of total debt to total assets $(D/K)_{i,t}$
(2) Time-specific effects are controlled in all estimations by adding year dummies.
Industry effects are also controlled in all estimations by adding industry dummies.
(3) z-statistics are reported in the parentheses.
(4) Hansen test of overidentifying restrictions is distributed as chi-square under the null of instrument validity.
(5) * significant at 10% level; ** significant at 5% level; *** significant at 1% level.
(6) See notes to Table 1 for explanations of variables.

Endnotes:

[1] For example, in Guariglia, Liu, and Song (2008), less than 0.3% of the firms in their sample are publicly listed.

[2] It can be argued that listed firms having the state as the controlling shareholder are to be classified as SOEs. One other definition for SOE could also be that if the firm is a subsidiary of the Central SOEs under the control of the State-owned Assets Supervision and Administration Commission of the State Council (SASAC).

[3] All the mean values of the variables, except for the sales growth rate, compared between the two groups of observations have t-test significance level at 1% or lower i.e. the null hypothesis of no difference in the means is rejected for all variables except for the sales growth rate.

[4] However, the index was constructed based on a subsample of FHP's study and those firms were US firms which are arguably more mature. Applying the method on the Chinese listed firms in our sample may cast doubt on the applicability. Nevertheless, the index is a sort of ranking of degree of financial constraints; therefore, the nature should be the same for our constructed index for Chinese firms.