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Determinants of the capital structure of Chinese non-listed enterprises: Is TFP efficient?

Dongyang Zhang[a,*], Deqiang Liu[b]

[a] School of Economics, Capital University of Economics and Business, Zhangjialukou-121, Fengtai District, Beijing, 10070, China
[b] Graduate School of Economics, Kyoto University, Yoshida-honmachi, Sakyo-ku, Kyoto, 606-8501, Japan

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ABSTRACT

This paper investigates the relationship between TFP (Total Factor Productivity) and leverage measures (total, short-term and long-term leverage) of Chinese non-listed firms during the period 1999–2007. First, TFP is significantly and positively associated with the three leverage measures of private and foreign owned enterprises, but insignificantly correlated with state-owned enterprises. Second, financial constraints, leverage costs, and the institutional environment can affect the relation between TFP and leverage; this relation tends to be much stronger when enterprises face stronger financial constraints, higher leverage costs, and an underdeveloped institutional environment. Third, we show that TFP also plays a significant and positive role on formal and informal leverage. Our research offers new evidence that TFP is an important determinant of capital structure choices.

Introduction

During the transitional process from a planned to a market economy, firms in China are growing in an environment where access to external financing is very limited (Qian et al., 2009). Banking discrimination of non-state firms has insulated these from formal financing (Brandt and Li, 2003; Lu and Dranove, 2013), while state-owned enterprises (SOEs) have experienced soft budget constraints[1] (Chow and Fung, 1998, 2000; Héricourt and Poncet, 2009; Poncet et al., 2010; Guariglia et al., 2011; Ding et al., 2013; Chen et al., 2013). Due to the underdeveloped financial system and legal institutions, the environment has restricted the growth of productivity, the capital structure, and the economy in China to some extent.[2] We believe that understanding capital structure choices in China is important not only because the choice of the capital structure is deeply influenced by the institutional environment, but also because China is the largest developing transitional economy.

It is interesting to test whether the capital structure choices of developed economies identified in the literature hold in this context. While the majority of research results has been derived from the experience of developed economies that have many institutional and financing similarities (Rajan and Zingales, 1995; Ozkan, 2001; Chui et al., 2002; Bevan and Danbolt, 2002), little has been done to deepen the knowledge regarding capital structures within developing countries with different institutional and

* Corresponding author.
E-mail address: zhangdongyang@cueb.edu.cn (D. Zhang).

[1] SOEs experienced soft budget constraints as these enterprises were granted generous loans from state-owned banks to improve their dismal financial conditions.

[2] In response to this, reforms launched in China have been carried out to create a market-oriented financial system. An important practice in this process is "ZHUANZHI", and the economy has made the transition from a complete reliance on state and collective enterprises to a more mixed economy where privately owned enterprises are thought to play a more significant role on growth since the mid-1990s (Qian et al., 2009). Additionally, foreign capital and enterprises have been allowed to participate in the Chinese domestic market since the late 1980s. This transformation has been accomplished through dynamic growth of the de novo private sector and through the privatization of SOEs.

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financing structures (e.g., Wiwattanakantang, 1999; Booth et al., 2001; Delcoure, 2007). Moreover, only a few studies have tested the determinants of capital structure choices of Chinese listed enterprises (Chen, 2004; Zou and Xiao, 2006; Huang and Song, 2006; Bhabra et al., 2008; Qian et al., 2009; Tsai et al., 2014; Chang et al., 2014).

To date, a consensus has yet to be reached even concerning developed countries, but especially China, since very few studies have tested Chinese non-listed firms.[3] In this paper, we focus on Chinese non-listed firms and investigate the behavior of leverage financing in the corporate sector during the transition period. Moreover, we examine how the determinants of leverage structure choices influence non-listed Chinese firms and offer new evidence for this field.

Firm performance is an important determinant factor of the capital structure. Firm profitability and productivity are influential yet different proxies for measuring firm performance (Ju and Yu, 2015). While the pecking order theory (Myers and Majluf, 1984) and the static trade-off theory (Myers, 1977) only focus on profitability to explain the determinants of leverage structure choices, there are many restrictions on using profitability in China's case. First, the type of ownership impacts the objectives of Chinese firms. Shleifer and Vishny (1994) demonstrated that the controlling party may not have profit-maximizing objectives. SOEs prioritize social welfare for the public. Particularly in China, local governments have incentives to extract revenue from firms that they control and then maximize profit (Qian and Stiglitz, 1996), whereas private firms are more concerned with maximizing profits (Firth et al., 2006). In general, TFP is neutral because it is determined by how efficiently and intensely the inputs are utilized in production (Comin, 2006).

Second, Cai et al. (2011) indicated that measuring Chinese firm managers' incentives is opaque and difficult because Chinese firms have hybrid ownership and managerial discretion. On one hand, managers' income is not always related to firm performance. On the other hand, even for managers whose income is correlated with firm performance, expanding managerial discretion may be accompanied by high agency costs when managers tend to experience a lack of accountability and external monitoring (Qian, 1996). In addition, managers tend to seek unobserved income (Qian and Stiglitz, 1996). TFP reflects the efficiency of the production process, which is not as heavily dependent on managers' incentive. Hence, TFP is an appropriate indicator to capture the realities of firm performance.

Third, Cai et al. (2011) found that firm profit estimations should be treated with caution, especially losses. This is due to firms' genuine failure in business as well as to false claims. Moreover, hiding of profits has been a persistent and widespread phenomenon among Chinese firms (Wang and You, 2012). Qian and Xu (1993) concluded that SOEs hide profit from the multi-layer-multi-region (M-form) hierarchy (with both vertical and horizontal interdependence). As the M-form economy becomes decentralized, the bottom level local governments have more power in policymaking and more responsibility for the local economic development. Therefore, there is rising competition to grow and become richer across regions on the horizontal line, which then puts greater pressure on local governments along the vertical line (Xu, 2011). Qian and Stiglitz (1996) also reported that bottom level governments and their agencies prefer to hide profits in order to avoid interference and predation from higher level governments. Consequently, bottom level governments are able to hold wealth and resources, which can be used to boost the local economy. Based on the above analysis, we demonstrate that TFP is another firm performance measure and capital structure determinant in China's case.

Our paper makes several contributions. First, we analyze the effect of TFP on leverage measures in the Chinese non-listed firm context. We show that TFP is an important factor that restricts a firm's capital structure choices. Neither the pecking order theory nor the static trade-off theory mentions the role of TFP in determining capital structure choices. Particularly, this relation remains unknown in China. Our second contribution is that we utilize three measurements (total leverage, short-term leverage, and long-term leverage) to enrich the discussion on the relation between TFP and capital structure choices. Third, some of the literature finds that the availability of finance helps firms improve TFP, as finance may enable firms to optimize operations and carry out TFP enhancing activities (Moreno-Badia and Slootmaekers, 2009; Chen and Guariglia, 2013). Our test finds that the reverse link also works and that there is a virtuous circle between TFP and firm leverage. Fourth, our large sample of Chinese non-listed firms' data provides a suitable test environment. Chinese firms have experienced enormous productivity growth and the country has transformed from a virtually closed economy into a global manufacturing center in just three decades. Yet its financial sector is largely underdeveloped compared to developed countries.[4] Firms, especially non-listed ones, struggle to procure financing (e.g., Allen et al., 2005; Héricourt and Poncet, 2009; Poncet et al., 2010; Guariglia et al., 2011; Cull et al., 2015). Hence, it is interesting to test the relation between TFP and finance leveraging of non-listed firms that typically suffer more from capital market imperfections and a lack of access to the stock market than listed firms. Fifth, we incorporate several firm heterogeneities into our analysis to enrich this study. Ownership, financial constraints, regional institutionalization, and leverage costs are utilized to deeply analyze and explain the relation between TFP and leverage.

The rest of this paper is organized as follows. Section 2 presents a literature review and our hypotheses. Section 3 introduces our econometric model and estimation methodology. Section 4 describes the dataset and presents the summary statistics. Section 5 discusses the results using GMM estimators, while Section 6 covers the robustness tests. Section 7 concludes the paper.

[3] For example, Li et al. (2009) use the NBS database test for the determinants of Chinese firms' capital structures. The NBS database has large and medium firms' information, including listed firms and a number of non-listed firms.

[4] In China, it is not so much the lack of a formal financial system, but rather its institutional bias that favors SOEs (Lardy, 1998; Cull and Xu, 2005; Cull et al., 2009).The Chinese stock market began to operate in 1990, and only became more regulated in 1999 when the China Securities Acts was enacted.

Literature review and hypotheses

2.1. Literature review

A few theoretical studies have discussed the issue of determinants of capital structure choices. There are two widely acknowledged competing theories of capital structure: the static trade-off theory (or optimal capital structure theory) (Myers, 1977) and the pecking order theory (Myers, 1984; Myers and Majluf, 1984). Although the applicability of these theories has been extensively tested, a consensus has yet to be reached (Bradley et al., 1984; Baskin, 1989; Helwege and Liang, 1996; Shyam-Sunder and Myers, 1999; Fama and French, 2002; Frank and Goyal, 2003).

The static trade-off theory rests on the costs (agency cost and financial constraints) and benefits of debt financing. In China, these conditions are only partially met. On one side, enterprises do not benefit from debt financing; for example, tax protects interest and lenders by monitoring the opportunistic behaviors of management. Especially for SOEs, where the agency cost problem is amplified, the monitoring role of debt becomes more valuable (Xu and Wang, 1999). On the other side, Chinese central and local governments have been reluctant to bankrupt SOEs because the Chinese government has the responsibility to maintain employment and social stability. Although the China Securities Regulatory Commission has delisted some firms with financial troubles since 2001, this can only lower but not eliminate the cost of financial distress (Zou and Xiao, 2006).

Additionally, Chinese firms still face some significant indirect costs of financial constraints, such as difficulty obtaining debt (Zou et al., 2003). Particularly, indirect costs are usually larger than direct costs (Warner, 1997). As one type of indirect cost, agency costs derived from the conflicts between shareholders and debt holders are likely to be higher in China. Large blocks of state control may raise moral hazard problems amongst borrowers (e.g., SOE managers are reluctant to commit to loan repayment schedules given the low chance of liquidation), inducing credit risks for lenders (Zou and Adams, 2008). Chinese central and local governments are divergent in both political economic interests and objectives, and incentive conflicts between shareholders and debt holders remain even when local government-owned firms borrow from central government- and state-owned banks (Sun and Tong, 2003).

Turning to the pecking order theory, which assumes the existence of information asymmetry, it predicts that enterprises will prefer internal financing to other sources, namely debt and issuing security, and will use less risky debt before risky external equity financing. Due to China's unique legal and institutional environment as well as the existence of financial constraints in the formal finance sector, Chinese firms follow a "new pecking order" model (retained earnings, equity). Chinese enterprises also rely heavily on short-term leverage, especially firm managers who prefer equity financing to debt financing (Chen, 2004). Comparison tests for these two existing theories have been carried out for Chinese enterprises. Chen (2004) demonstrated that the trade-off theory is less applicable to Chinese listed firms since neither the trade-off nor the pecking order theory, which were originally derived in western settings, provides a sufficient and satisfactory explanation for the capital choices of Chinese listed firms. However, Huang and Song (2006) further demonstrated that the static trade-off model is more useful in explaining the features of the capital structure of Chinese listed firms than the pecking order theory.

Drawing upon capital structure choice studies for developed economies (e.g., Harris and Raviv, 1991; Titman and Wessles, 1988; Rajan and Zingales, 1995; Booth et al., 2001), six major determinants of leverage have been identified: profitability, asset tangibility, growth opportunity, tax shields, volatility or earning risk, and firm size. In China's case, these determinants of capital structure choices have basically all been tested (e.g., Chen, 2004). By introducing ownership, Zou and Xiao (2006) demonstrated that it has a limited influence on the capital structure choices of Chinese listed firms. However, Bhabra et al. (2008) showed that ownership is an efficient factor affecting capital structure choices (both state and legal person influence the capital structure positively). Qian et al. (2009) suggested that the ownership structure significantly influences the capital structure choices of Chinese listed firms as it can affect agency incentives (Booth et al., 2001), contradicting the findings reported by Huang and Song (2006). Li et al. (2009) further showed that ownership is also an important factor in Chinese non-listed firms (state ownership is positively and foreign ownership negatively associated with leverage).

Recent studies have discussed capital structure choices from some new perspectives. For example, Qian et al. (2009) extended the basic model to allow both the target level and the speed of adjustment to be determined endogenously, and found that Chinese listed firms tend to adjust faster if they are farther away from the equilibrium leverage level. Tsai et al. (2014) examined the effects of China's split structure reform on the leverage decisions of listed enterprises and reported that state ownership plays a decisive role in driving multiple large shareholders to collude with the controlling shareholders. Chang et al. (2014) retested the basic determinants of capital structure in Chinese listed firms. They identified profitability, industry leverage, asset growth, tangibility, size, state control, and the largest shareholder as reliable core factors to explain leverage.

Table 1 summarizes the determinants of capital structure choices, definitions, predicted (empirical tested) signs, and the results of previous empirical studies. In China's case, the applicability of these determinants on capital structure choices have been extensively tested, but a consensus has yet to be reached. Comparing these determinants, we reviewed the literature in this field and introduce firm productivity as a new proxy to explain capital structure choices in this paper. We control for TFP (Total Factor Productivity) as the main proxy of firm productivity.

There are several explanations for why we chose TFP to analyze capital structure choices. First, TFP is the portion of the output not explained by the amount of inputs used in production. Thus, its level is determined by how efficiently and intensely the inputs are utilized in production (Comin, 2006). TFP reveals differences in economic growth and income levels across countries and regions (Caselli and Gennaioli, 2005; Hsieh and Klenow, 2010). Therefore, firms adjust their choice of capital structure to their TFP level during the production process, and the relation between TFP and capital structure is affected by the region and the institutional environment.

Table 1
Comparison of selected studies on the determinants of the Chinese capital structure.

	Trade-off	Pecking Order	(2004)	(2005)	Huang and Song (2006)	(2006)	(2008)	(2009)	(2009)	(2014)	(2014)
Sample Information			1995–2000 Listed Firms	2002–2003 Listed Firms	1994–2000 Listed Firms	1993–2000 Listed Firms	1992–2001 Listed Firms	1999–2004 Listed Firms	2000–2004 NBS Database	1998–2009 Listed Firms	2001–2010 Listed Firms
Profitability	(+)	(−)	ROA (−)	ROA (−)	ROA (−)	ROA (−)	ROA (−)	ROA (−)	ROA (−)	ROA (−)	ROA (−)
Growth Opportunity	(−)	(+)	Assets Growth (+)	Assets Growth (+)	Tobin's Q (−)	Market Book Ratio of Assets (−)	Tobin's Q (−)	Sales Growth		Assets Growth (+)	Market Book Ratio of Assets (+)
Firm Risk	(−)	(−)	Change of Earnings (−)		Std. dev. of Earnings	Std. dev. of Earnings		Std. dev. of Earnings (+)		Std. dev. of Stock Returns (+)	
Non-debt Tax Shields			Non-debt Tax Shields (−)		Non-debt Tax Shields (−)	Non-debt Tax Shields		Non-debt Tax Shields (−)		Non-debt Tax Shields (−)	
Asset Tangibility	(+)	(−)	Fixed Assets and Inventories (+)		Fixed Assets (+)	Fixed Assets and Inventories (+)	Fixed Assets (+)	Fixed Assets (+)	Fixed Assets (−)	Fixed Assets (+)	Fixed Assets (+)
Firm Size	(+)	(−)	Assets (+)	Invested Capital (+)	Sales (+)	Assets (+)	Assets (+)	Sales (+)	Sales (+)	Assets (+)	Assets (+)
Ownership					State Ownership	State Ownership	State Ownership	State Ownership (+)	State Ownership (+)	State Ownership (−)	State Ownership
Institutional Effect			Exchange Dummy		Region Dummies				NERI Index	NERI Index	

Second, TFP is a meaningful and stable indicator of productivity. Productivity has been used to gauge firm performance in the corporate finance literature (Schoar, 2002; Maksimovic and Gordon, 2002; McGuckin and Nguyen, 1995; İmrohoroğlu and Tüzel, 2014), the management accounting literature (Kaplan, 1986), and the literature on corporate control (Köke and Renneboog, 2005). It is an important determinant of how firms react to business cycle fluctuations. As TFP is relatively stable over both the short and the long term, it is convenient to use TFP as a proxy to determine capital structure choices.

Third, Driffield et al. (2013) demonstrated that "apart from studies on regulated industries that seek to distinguish directly between efficiency-enhancing and rent-increasing effects (Saal and Parker, 2001; De Witte and Saal, 2010), much of the literature (perhaps rather erroneously) sees productivity and profitability as closely related". However, distinguishing productivity from profitability is an important issue. Grifell-Tatj & and Lovell (1999) highlighted the key differences between measures of productivity and profitability. This distinction has also been discussed in a number of contexts related to our research. For example, Girma et al. (2006) argued that productivity refers to the returns achieved by internal stakeholders, namely that increases in productivity boost discretionary resources potentially available to both internal stakeholders ('the insiders') and external stakeholders (in particular shareholders and tax collectors). In contrast, profits represent only the returns that are available to external shareholders after internal stakeholders have taken their returns. In particular, shareholders benefit directly from profits distributed as dividends and indirectly from retained profits that may increase a firm's net present value. Thus, we consider TFP as a more suitable and significant determinant of capital structure choices. We build on Girma et al. (2006), but also explain some specifications for China's case below.

Fourth, we further discuss the divergence between TFP and profitability in China. Similar to previous findings (Li et al., 2008; Wu et al., 2012; Ding et al., 2014), a political connection has a positive effect on firm performance (roa and roe). Because enterprises with political connections can easily access government procurement projects with relatively higher prices than the market price, their profitability may be higher even if their TFP is rather low. Therefore, distinguishing TFP and profitability is one of our contributions to the literature on capital structure choices.

2.2. Hypotheses

Previous theoretical work has taken into account the imperfections of financial markets and has shown that a firm's capital structure emerges from firm-specific and macroeconomic factors (Frank and Goyal, 2009). Firm leverage decisions are among the most important decisions made by firm executives and have been the focus of intense scrutiny since Modigliani and Miller (1958). The relationship between leverage and firm performance has been discussed a lot.

The trade-off theory goes back to Kraus and Litzenberger (1973), who weigh bankruptcy costs against the benefits of interest tax shields. Agency problems can be mitigated by the benefits of debt. Particularly, debt has a disciplining role due to the associated reduction in cash flow (Jensen, 1986). The costs of debt include debt overhang (Myers, 1977), risk-shifting (Jensen and Mecklin, 1976), bankruptcy costs (Warner, 1977), and asset fire sales (Schleifer and Vishny, 1992). The trade-off theory predicts that the net benefits to debt financing rise for companies with low debt but decrease as leverage becomes high. The empirical literature typically tests this hypothesis (against the competing pecking order theory) by running cross-sectional or panel regressions of leverage on various firm-level, industry-level and market characteristics that determine the optimal leverage. However, while previous research has explored the relationship between leverage and firm value or performance (e.g., McConnell and Servaes, 1995; Berger and di Patti, 2006; Driffield et al., 2007), it has remained silent on the relationship between leverage and productivity.

Among all possible measures of firm performance, our analysis focuses on TFP growth in particular for several reasons. Productivity growth is generally considered to be the main driver of growth at the macroeconomic level. A number of studies have demonstrated that TFP growth is more important for income growth than other factors such as capital accumulation, and that differences in TFP explain more of the variation in cross-country per capita GDP than variables like human capital, physical capital or trade (Klenow and Rodriguez-Clare, 1997; Hall and Jones, 1999; Henry et al., 2009). Second, TFP has also been used to gauge firm performance in the corporate finance literature (e.g., Schoar, 2002; Maksimovic and Gordon, 2002; McGuckin and Nguyen, 1995; İmrohoroğlu and Tüzel, 2014), the management accounting literature (Kaplan, 1983), and the literature on corporate control (Köke and Renneboog, 2005). Third, TFP is an important determinant of how firms react to business cycle fluctuations. İmrohoroğlu and Tüzel (2014) find that low TFP firms are more vulnerable to business cycles and hence riskier than firms with high TFP. Several papers find that TFP is positively related to firm value. Intuitively, TFP growth results in efficient use of the firm's resources, which allows the firm to reduce its output prices while maintaining or increasing profit margins. In the long run, TFP growth enables the firm to remain profitable and survive, which enhances shareholders' wealth.

Based on the above analysis, this paper attempts to provide new evidence bridging the gap between the literature on the optimal capital structure and the microeconomic literature on finance-growth linkages. We build several hypotheses in this section.

2.2.1. General hypotheses

This paper takes a different route from the previous literature and attempts to answer the question which financial systems allocate the available economic resources most efficiently by analyzing the relationship between a firm's capital structure and its productivity. Besides, we want to find out whether TFP is a determinant of capital structure.

The rationale is the following:

First, we discuss the mechanism from the demand side. When firms are more productive, as measured by TFP, they are more incentivized to engage in innovation and investment to expand their market shares. Guadalupe et al. (2012) established a model that shows the complementarity between the extent of innovation and the acquired firm's initial characteristics, reflected in the initial TFP. They show that the surplus created by innovation is greater when the firm's initial TFP is higher. Firms undertaking innovative

activities typically hold specialized equipment and a large share of immaterial assets, such as patents, research knowledge, or project-specific human capital (Nucci et al., 2004). Since innovation and investment require financing sources and our firms are all non-listed, firms can only rely on bank loans to finance innovation and investment, i.e., by increasing their leverage.

Second, we try to explain the mechanism from the supply side. Outside lenders, especially banks, may prefer giving loans to more productive firms. Even though firms' TFP is not fully observable, banks could efficiently utilize all financial information, such as profitability, sales growth and cost structure, to infer their productivity. Theories based on agency costs and information asymmetries suggest that equity financing is subject to severe underpricing in firms holding more intangibles (Myers and Majluf, 1984), favoring the use of debt over equity financing (i.e., higher leverage). Financial systems more capable of providing the type of funding used by firms with higher productivity should therefore also guarantee higher aggregate productivity (Griliches and Lichtenberg, 1984; Nucci et al., 2004).

Both of these mechanisms imply that productivity can positively affect firms' capital structure, i.e., the leverage ratio. This leads to the following hypothesis:

Hypothesis 1. a. There is a positive relation between TFP and our leverage measures.

Berger and Bonaccorsi di Patti (2006) stipulated that more productive firms are more likely to earn higher returns in a given capital structure, and that higher returns act as a buffer against portfolio risk. Thus, more productive firms are better positioned to control their capital structure. Low TFP firms are more vulnerable to business cycles and consequently riskier than firms with a high TFP (İmrohoroğlu and Tüzel, 2014). Firms with higher TFP should have a lower bankruptcy risk and financial distress (Margaritis and Psillaki, 2010). Hence, more productive firms choose to use higher leverage ratios. In addition, the signaling theory (Ross, 1977) demonstrated that high quality firms choose higher leverage to signal their quality because issuing debt exposes firms to costly financial distress (Ovtchinnikov, 2010).[5] Because higher TFP is a high quality signal to financing lenders, higher TFP firms can raise more leverage. In addition, it is an important determinant of how firms react to business cycle fluctuations. In the framework of İmrohoroğlu and Tüzel (2014), low TFP firms are more vulnerable to business cycles and hence riskier than firms with high TFP. Low TFP firms have a higher implied cost of capital (ICC) and both the levels of ICC and the ICC spread between low and high TFP firms are countercyclical. Several papers find that productivity is positively related to firm value (e.g., Coricelli et al., 2012). This leads to the following hypothesis:

Hypothesis 1. b. The relation between TFP and leverage in high TFP enterprises is stronger than that in low TFP enterprises.

The literature on state ownership shows that while state ownership enhances firms' access to debt, it adversely affects managerial incentives and firm performance (Dewenter and Malatesta, 2001; Khwaja and Mian, 2005). Tian (2001) noted that the state may be more inclined to assist firms in which it retains a large stake in securing bank loans out of economic and/or social considerations.[6] When turning to the lenders' perspective, the lending decisions of state-owned banks are politically motivated (Sapienza, 2004; Dinç, 2005), especially as bank managers have a strong incentive to maintain a good relationship with government officials and are more willing to grant loans to SOEs than to private enterprises (Brandt and Li, 2003). These works imply that SOEs often have better access to bank loans despite their TFP levels. This leads to the following hypothesis:

Hypothesis 1. c. The relation between TFP and our leverage measures is insignificant for SOEs.

2.2.2. Hypotheses on firm heterogeneity

Financial constraints. Financial constraints influence the investment behavior, the financing environment, and TFP. As TFP is highly correlated with the financial constraint level, high TFP benefits from the financial health of firms (Silva, 2011). Previous studies demonstrated that internal financing plays a more important role on TFP or investments than external financing in financially constrained Chinese firms (Héricourt and Poncet, 2009; Poncet et al., 2010; Guariglia et al., 2011; Ding et al., 2013; Chen et al., 2013). Firms facing stronger financial constraints do not choose a capital structure in the same manner as firms with weaker constraints (Korajczyk and Levy, 2003). As highly financially constrained firms lack efficient financing tunnels, they prefer to utilize more leverage to satisfy the capital input level required by a given or targeted TFP. In addition, from the perspective of the signaling theory, when firms are facing stronger financial constraints, they lack financing channels, increasing their need to signal their quality. TFP is a more efficient signal to lenders to facilitate access to leverage, and the TFP of highly financially constrained firms is more sensitive to leverage because information asymmetries between insiders and outside lenders are lower. Thus, we expect the relation between TFP and leverage measures of more financially constrained firms to be stronger than that of less financially constrained firms. This leads to the following hypothesis:

Hypothesis 2. The relation between TFP and leverage is moderated by financial constraints.

Institutional background. Institutional reforms are assumed to reduce transaction costs and investment risks as well as to enhance

[5] Measuring firm quality is not a straightforward task (Ovtchinnikov, 2010). In this paper, we consider TFP as a measure of firm quality due to the characteristics explained in Section 2.1.

[6] To maintain social stability and employment, the state can pressure banks to supply loans to SOEs even if it is detrimental to the banks' interests (Brandt and Li, 2003). Fan et al. (2015) also found that the TFP of SOEs may not accurately reflect their productivity, as SOEs typically employ a lot of unnecessary labor.

business opportunities. Consequently, institutional reforms generate greater returns to private sector investments and innovations (Ades and Di Tella, 1999; Dreher et al., 2007; Boerner and Hainz, 2009). Firms in a well-developed institutional region have higher TFP and more leverage. However, Giannotti (2003) suggested that enterprises tend to have higher leverage in countries with less developed stock markets. Considering that neither stock nor bond markets were well developed in China (Berger et al., 2009) before the split share structure reform, both listed and non-listed firms had to rely heavily on debt financing. Li et al. (2009) showed that firms in more developed regions are associated with reduced access to debt, suggesting that more alternative financing channels are available and lending standards are tightening under the ongoing banking reform. Because firms in less developed institutional regions lack efficient financing tunnels, they prefer to utilize more leverage to satisfy the capital input level required by a given or targeted TFP. Moreover, from the perspective of the signaling theory, firms in less developed institutional regions lack financing channels, increasing their need to signal quality. TFP is a more efficient signal to lenders to facilitate access to leverage, and the TFP of firms in less developed institutional regions is more sensitive to leverage because information asymmetries between insiders and outside lenders are lower. Thus, we expect that the relation between TFP and leverage is weaker in a more developed institutional environment than in a less developed institutional environment. This leads to the following hypothesis:

Hypothesis 3. The relation between TFP and leverage is moderated by the institutional environment.

Cost of debt. It has been examined how the cost of debt influences the capital structure, but a consensus has yet to be reached for developed economies (Anderson and Reeb, 2003; Sánchez-Ballesta and García-Meca 2007; Borisova and Megginson, 2011). The behavior of debt suppliers (debt lenders) and demanders (firms) determines the cost of debt and the level of the domestic financial market. First, firms with high TFP generally have better opportunities for investment and are more likely to pay higher interest to lenders (Lai, 2011). On the other hand, more productive firms are also more likely to earn higher returns to cover the costs of debt (Berger and Bonaccorsi di Patti, 2006). Second, firms face high costs of debt. One possible reason is that there is either strong demand related to competition for debt or a tightening supply of credit by the local banks. The situation is close to one where firms are suffering from financial constraints. Thus, high cost firms have an increased incentive to signal efficiency to obtain debt. Another reason is that a relatively underdeveloped local financial system indicates a weak institutional environment. The mechanism here is similar to the abovementioned institutional setting. On the other hand, firms with access to more financing channels are able to obtain loans at lower costs. Therefore, firm efficiency is more sensitive to higher costs of debt. Similarly, when the cost of debt is low, the relation is less sensitive. This leads to the following hypothesis:

Hypothesis 4. The relation between TFP and leverage is moderated by the cost of debt.

3. Empirical specifications and estimation methodology

3.1. Baseline specification

Using the same standards as Frank and Goyal (2009), we identify seven variables as reliably important and statistically significant factors that have coefficients of inconsistent signs across various models. Specifically, we estimate our model as follows:

$$Leverage_{it} = \alpha_0 + \alpha_1 Leverage_{i,t-1} + \alpha_2 TFP_{it} + \alpha_3 X_{it} + v_i + v_j + v_t + v_{jt} + \varepsilon_{it} \quad (1)$$

where $Leverage_{it}$[7] indicates the external finance source of firm i at time t. To measure external finance, we utilize three measurements: total leverage, short-term leverage and long-term leverage. X_{it} is a vector of a firm's capital structure choice variables, including profitability, non-debt tax shields, growth opportunity, tangibility, volatility, firm size, and age (Chen, 2004; Huang and Song, 2006; Frank and Goyal, 2009; Bhabra et al., 2008; Qian et al., 2009; Chang et al., 2014; Tsai et al., 2014). TFP is our key explanatory variable; the estimation of TFP is explained in Section 3.3. All data in this paper are deflated.[8]

v_i is a firm-specific effect that we control for to regress Eq. (1) in first differences; v_j is an industry-specific effect measured by an industry dummy. There are 37 industries, where the basic industry is textile manufacturing (Brandt et al., 2012). v_t is a time-specific effect that we control for using a time dummy, v_{jt} is used to control for industry-specific business cycle effects (Guariglia et al., 2011; Chen et al., 2013). Finally, ε_{it} is an idiosyncratic error term.

3.2. Hypothesis design and specifications

Based on the hypotheses discussed in Section 2.2, we further estimate our model with Eq. (2):

$$Leverage_{it} = \alpha_0 + \alpha_1 Leverage_{i,t-1} + \alpha_2^{'} TFP_{it} + \alpha_2^{''} TFP_{it} * dummy_{type} + dummy_{type} + \alpha_3 X_{it} + v_i + v_j + v_t + v_{jt} + \varepsilon_{it}, \quad (2)$$

[7] A firm's decision on its capital structure is inherently dynamic (Qian et al., 2009). In this paper, we follow Flannery and Rangan (2006) and others and formulate a dynamic capital structure model that allows one period lagged leverage.

[8] The definitions of all the variables used in this paper are in the Appendix A. Our data have been deflated using deflators taken from the China Statistical Yearbook (various issues) published by the National Bureau of Statistics of China. We use the provincial capital goods deflator to deflate the capital variables and the gross domestic product (GDP) deflator to deflate other variables.

$dummy_{type}$ is a series of dummy variables to measure the hypotheses in Section 2.2. Detailed information on each dummy is given below.

3.2.1. Financial constraints

To study the role of financial constraints on a firm's behavior, the literature has suggested many possibilities, including investment-cash flow sensitivities (FHP) (Fazzari et al., 1988; Fazzari et al., 2000).[9] Nevertheless, using investment-cash flow sensitivity as an indicator of financial constraints is not without criticism.[10] Lamont et al. (2001) produced the KZ index[11] because Kaplan and Zingales (1997) argued that firms identified as financially constrained in FHP are actually not constrained at all in a depth study of investment-cash flow sensitivity.[12]

Based on the KZ index, Whited and Wu (2006) introduced the WW index of constraints.[13] The SA index introduced by Hadlock and Pierce (2010) is an update of Kaplan and Zingales (1997) and is derived from the size and age variables of a firm.

We select the SA index for our research for three reasons: (1) The KZ index needs Tobin's Q, which is not applicable to our sample of Chinese non-listed firms. (2) The WW index needs dividend variables, which are not available for our database. In addition, these would need to be corrected and used in our robustness test. (3) Compared with the SA index, the KZ and WW indices incorporate more financial factors, which may pose greater endogeneity problems. Additionally, the SA index avoids the problem that the same information is mechanically built into both the dependent and independent variables.

To our knowledge, this is the first time the SA index is used to evaluate the level of financial constraints in Chinese non-listed firms. We include the SA index in our econometrics model to evaluate the level of financial constraints in our samples.

$$Leverage_{it} = \alpha_0 + \alpha_1 Leverage_{i,t-1} + \alpha_2^{'} TFP_{it} + \alpha_2^{''} TFP_{it} * fc^{high} + fc^{high} + \alpha_3 X_{it} + v_i + v_j + v_t + v_{jt} + \varepsilon_{it} \quad (3)$$

fc denotes the financial constraint level. The SA index is adopted to evaluate this indicator.[14] We divide the financial constraints into two levels according to the quantiles of the SA index. fc^{high} is a dummy variable that equals 1 if the SA index is above the 50% quantiles and 0 otherwise.

3.2.2. Institutional development

Institutional development is measured by the National Economic Research Institute's yearly index of marketization for each province in China, as reported in Fan et al. (2011). Previous studies have employed this index to measure the institutional environment (see, e.g., Wang et al., 2008; Firth et al., 2009; Li et al., 2009). The index is purported to measure a province's relative progress towards a market economy compared to other provinces. It is derived from 23 indicators of institutional arrangements and policies in five areas, including government-market relations and the development of the non-state sector, a product market, factor markets and intermediaries and the legal environment. The index and all components are measured on a 0–10 scale, with higher scores indicating greater institutional development.

$$Leverage_{it} = \alpha_0 + \alpha_1 Leverage_{i,t-1} + \alpha_2^{'} TFP_{it} + \alpha_2^{''} TFP_{it} * id^{bad} + id^{bad} \alpha +_3 X_{it} + v_i + v_j + v_t + v_{jt} + \varepsilon_{it}, \quad (4)$$

where id denotes the institution development level (total development indicator). The financial constraints are divided into two levels according to the quantiles of the institution development index. id^{bad} is a dummy variable that equals 1 if the institution development index is below the 50% quantiles and 0 otherwise.

3.2.3. Leverage cost

Similar to previous studies (e.g., Bliss and Gul, 2012; Francis et al., 2005; Gray et al., 2009; Kimet al., 2011; Shailer and Wang, 2015), we use the interest rate as a proxy for the cost of debt, which is measured as a financial expense of an enterprise divided by the average short- and long-term debts. An alternative measure is the interest expense of an enterprise divided by its average short- and long-term debt (e.g., Lu et al., 2012).

$$Leverage_{it} = \alpha_0 + \alpha_1 Leverage_{i,t-1} + \alpha_2^{'} TFP_{it} + \alpha_2^{''} TFP_{it} * cost^{high} + cost^{high} + \alpha_3 X_{it} + v_i + v_j + v_t + v_{jt} + \varepsilon_{it}, \quad (5)$$

where $cost$ denotes the leverage cost, and the cost is divided into two levels according to the quantiles of the institution development index. $cost^{high}$ is a dummy variable that equals 1 if the cost of leverage is above the 50% quantiles and 0 otherwise.

[9] A few papers have tested whether the investment-cash flow sensitivities in the financial constraint hypothesis hold for Chinese firms' activities. We confirm that Chinese firms are financially constrained, but SOEs and foreign enterprises tend to be less constrained (H & ricourt and Poncet, 2009; Poncet et al., 2010; Chen and Guariglia, 2013; Ding et al., 2013; Guariglia and Liu, 2014; Cull et al., 2015).

[10] Chen and Chen (2012) documented that the investment-cash flow sensitivity has declined and disappeared, even during the 2007–2009 credit crunch.

[11] The KZ index (Lamont et al., 2001) is loaded positively on leverage and Tobin's Q, but negatively on cash flow, cash levels, and dividends.

[12] Lin et al. (2012) developed the KZ index for Chinese listed firms in 1999–2008 and found that although an average sample firm experiences some degree of financial constraints, being state-owned does not help reduce a firm's financial constraints on investment.

[13] Huang et al. (2008) found that, among domestic firms, the financing constraint index is highest for private and lowest for state-owned firms.

[14] The SA index (Hadlock et al., 2010) is measured as (-0.737*size) + (0.043*size^2)-(0.040*age), where size equals the logarithm of the inflation-adjusted total assets, and age is the logarithm of the number between observation year and open year.

3.3. Estimating the TFP equation

There are various methods to estimate TFP, the simplest of which is the Solow residual method (Solow, 1957) estimated by OLS. However, econometric issues arise because a firm's productivity can affect input choices, implying that the coefficient estimates obtained with OLS may be biased. A number of solutions have been proposed to overcome this problem, including firm-level fixed effects by Jefferson et al. (2008), the Olley and Pakes method (*OP*, 1996) and the Levinsohn and Petrin method (*LP*, 2003).

To better cope with the simultaneity and sample selection problem, we regress our TFP with the *LP* method and use TFP regressed by *OP* and *OLS* as part of our robustness tests.

Specifically, we assume that the production function of China's manufacturing firms takes the Cobb–Douglas form, which is given as

$$Y_{it} = A_{it} L_{it}^{\beta_l} K_{it}^{\beta_k} M_{it}^{\beta_m}, \tag{6}$$

where Y_{it} represents the physical output of firm i in period t; L_{it}, K_{it} and M_{it}[15] are the inputs of labor, capital, and intermediate inputs, respectively. A_{it} is the Hicks neutral efficiency level of firm i in period t. Taking the natural logs and differentiating the equation yields the following linear production functions:

$$y_{it} = lnA_{it} + \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it}, \tag{7}$$

$$TFP_{it} = y_{it} - \beta_l l_{it} - \beta_k k_{it} - \beta_m m_{it}, \tag{8}$$

where β_l, β_k, and β_m are estimated using *LP*, *OP*, and *OLS*, respectively.

3.4. Endogeneity problem

In examining the determinants of leverage, one issue is the potential endogeneity of the explanatory variables with respect to leverage. Generally, there are two types of endogeneity problems. One is the reversed causality problem. In this paper, our basic hypothesis postulates that capital structure measured by leverage is positively determined by TFP. Moreover, previous studies show that leverage is significantly related to TFP (Nucci et al., 2004; Chen and Guariglia, 2013 Chen and Guariglia, 2013), as TFP allows firms to use resources efficiently. Firms anticipate shocks to productivity or profitability and adjust inputs accordingly throughout the production process (Coricelli et al., 2012). Thus, its level is determined by how efficiently and intensely the inputs are utilized in production (Comin, 2006). This allows firms to reduce their output prices while maintaining or increasing their profit margins, and in the long run, to survive (Coricelli et al., 2012) through their choice and control of inputs. Leverage is part of the capital resources, which are strongly related to TFP. Thus, there is a reversed causality cycle between TFP and leverage.

The other is the omitted variables problem. Unobservable corporate-specific fixed effects affect the capital structure (e.g., the entrepreneurship and the managers' experience and professional level can decide the investment and capital structure choice of a firm), simultaneous causality for financial constraints (Shailer and Wang, 2015), and dynamic panel bias (Nickell, 1981; Arellano and Bond, 1991; Bond, 2002).This method allows the potential endogeneity problem to be addressed because firms anticipate shocks to productivity and adjust their inputs accordingly throughout the production process (Coricelli et al., 2012). Unobservable corporate-specific fixed effects also affect ownership, cost of debt, and financial constraints, simultaneous causality for cost of debt and financial constraints (Shailer and Wang, 2015), and dynamic panel bias (Nickell, 1981; Arellano and Bond, 1991; Bond, 2002).

We estimate all our equations using the system GMM estimator developed by Arellano and Bond (1991) and Blundell and Bond (1998), which enables us to control for possible simultaneity and endogeneity problems in our models. The estimator combines the equation in first differences with an equation in levels in one system. By adding the original equation in levels to the system and exploiting the additional moment conditions, Blundell and Bond (1998) found a dramatic improvement in efficiency and a significant reduction in finite sample bias compared with the simple first-differenced GMM.

Lagged values of the regressors are used as instruments to control for the possible endogeneity of regressors. Following Chen and Guariglia (2013), we treat all regressors in our equations except age (TFP, Profitability, Tax Shields, Growth Opportunity, Volatility, Tangibility, Size) as endogenous and instrument them using their lagged levels in the differenced equation and their lagged differences in the levels equation. We also include year dummies, two-digit industry dummies, and year dummies interacted with industry dummies in all our regressions and instrument sets.

In addition, we use two criteria to test whether our estimations are reasonable. First, we assess the presence of the n^{th}-order serial correlation in the different residuals, which is denoted as the $m(n)$ test. The regressed estimations are reasonable if these specifications are exempted from the derail correlation in the 1st-difference residuals. In the presence of serial correlation of order n, lags $n+1$ and deeper are strictly required in the instrument set (Brown and Petersen, 2009; Roodman, 2009). The $m(n)$ test is asymptotically distributed as a standard normal distribution under the null hypothesis for no n-order serial correlation of the differenced residuals.

[15] Y_{it} is measured by the logarithm of sales, L_{it} is measured by the logarithm of the number of employees, and K_{it} is measured by the logarithm of net fixed assets. To better cope with simultaneity and sample selection problems, *LP* and *OP* use intermediate inputs to solve this problem. To account for the characteristics of the intermediate inputs M_{it}, we control for the firm-level intermediate input variable from the balance sheet to measure TFP with *LP*, while we use capital input calculated by the perpetual inventory method as the proxy of the intermediate input to measure TFP with *OP*. The equation of capital input is $I_t = K_t - (1-\rho)^* K_{t-1}$, where I_t is the capital input, K_t is the fixed capital, and ρ is the depreciation rate. In our regression, we choose the rate of depreciation as 0.15.

Second, to evaluate whether our instruments are legitimate and our model is correctly specified, we assess whether the variables in the instrument are uncorrelated with the error term in the relevant equations. We use the Sargan test and the Hansen test (*J* test) to identify restrictions. The result of this test for instrument validity is asymptotically distributed as a chi-square with degrees of freedom equal to the number of instruments less the number of parameters. However, when using system GMM to estimate the production function based on a large panel dataset, the Sargan test tends to over-reject the null hypothesis of instrument validity (Blundell and Bond 2000; Benito and Hernando, 2007; Becker and Sivadasan, 2010). Because our panel dataset is huge, we choose the Hansen test as a major reference.

4. Data and descriptive statistics

4.1. Data

We use data drawn from the annual financial accounts filed by non-listed industrial firms from the GTA (GuoTaiAn) database via CSMAR (China Securities Market & Accounting Research) during the period 1999–2007. We chose 2007 as our sample end year to avoid confounding effects due to the significant changes in China's financing environment on firms' cost of debt and financial constraints following the global financial crisis (Levinger, 2014; Shailer and Wang, 2015).[16] Our data covers 41 industries and includes enterprises with annual sales of five million Yuan (about US $650,000) or more. Our sample consists of all non-listed Chinese enterprises with debt financing and available data. Due to data restrictions, "we dropped observations with negative sales, negative total assets minus total fixed assets, negative total assets minus liquid assets, and negative accumulated depreciation minus current depreciation. Firms that did not have complete records on our main regression variables were also dropped. To control for the potential influence of outliers, we excluded observations in the one percent tails of each of the regression variables. Finally, we dropped all firms with less than 5 years of consecutive observations" (Guariglia et al., 2011). In addition to the above treatment, we further matched the address, telephone number and industry code of firms, and omitted observations for firms with less than eight employees (Brandt et al., 2012). Finally, our unbalanced panel covers 118,356 non-listed firms, corresponding to 625,618 firm-year observations.[17]

Compared to the listed database, our data has some advantages for testing our hypothesis. First, listed firms have more financial intermediations than non-listed ones. Financial constraints are an important concept that can decide the capital structure of firms; compared to listed firms, non-listed firms have less financial tunnels and suffer more severely from financial constraints. Moreover, the information disclosure of non-listed firms is worse than that of listed firms. From this approach, non-listed firms are more financially constrained. Thus, non-listed data supplies us with an interesting environment to test whether TFP and other firm performance variables can determinate the capital structure against a financial constraints background or not.

Additionally, listed firms can issue bond on the stock market, the capital structure is difficult to measure, and both leverage and stock bond are needed to measure the capital structure. For non-listed firms, the capital structure can clearly be measured by using leverage (total, short-term, long-term). Therefore, a relatively easy framework can help better understand the linkage between TFP and capital structure.

4.2. Descriptive statistics

Table 2 displays the descriptive statistics of our key variables. For the variable of total leverage, the average value for firms with different ownership types generally fluctuates around 0.6. SOEs have the highest leverage (0.688) and foreign firms the lowest (0.501). Compared to other countries, the relatively high leverage indicates that firms rely strongly on leverage. After all, for non-listed firms, leverage should play the foremost role and account for the predominantly high proportion. However, by further dividing leverage according to leverage maturities, short-term leverage generally fluctuates around 0.5, whereas long-term leverage accounts for around less than 0.1. Consistent with the previous results, in terms of both long-term and short-term leverage, the SOEs group is the highest (0.557 and 0.106, respectively), while the foreign group is the lowest (0.453 and 0.027, respectively). This is consistent with the reality that in China SOEs can easily gain access to loans and other debts from banks and other financial institutions while foreign firms tend to rely more on their own country's capital market rather than on debt financing.[18] Additionally, this is consistent with the financial constraint levels measured by the SA index: the SOE group has the weakest financial constraints (-3.009) while the private group has the strongest (-3.129). With respect to productivity, the foreign group has the highest TFP (4.745), whereas the SOE group has the lowest (3.642). Regarding profitability, the private group has the highest (0.168) and that of SOEs is as low as 0.049. This echoes the fact that in China SOEs generally have lower efficiency and profitability compared to firms with other types of

[16] Our period selection is also based on the fact that some main variables (e.g., input intermediation to calculate TFP using LP) are not available in our database after 2007.

[17] In fact, our original panels cover 134,768 non-listed firms, corresponding to 935,623 firm-year observations during 1999–2007. We identified five different types of firm ownership: state, collective, legal person, domestic private, and foreign. Following Cull et al., "collective firms are distinct from state-owned in that they are either owned by township-village governments or collectively by the employees. Legal-person share is a mixture of ownership by state legal persons and private legal persons" (Cull et al., 2009). By the end of the 1990s, nearly two thirds of all TVEs had been privatized in the provinces, although considerable differences existed across townships as to the extent of privatization (Brandt et al., 2003; Brandt and Li, 2003 Brandt and Li, 2003). Therefore, this paper discusses three typical types of ownership: state, private, and foreign. Ownerships of collective and legal persons are ambiguous and therefore not evaluated.

[18] Li et al. (2009) reported that ownership plays an important role in firms' capital structure choices. State ownership helps firms acquire more leverage than other types of ownership. Our results are consistent with their summary statistics.

Table 2
Summary of statistics for Chinese non-listed firms.

	Full sample				State	Private	Foreign
	Mean	Std. Dev.	Min	Max	Mean	Mean	Mean
Total Leverage	0.589	0.264	0.022	1.495	0.688	0.604***	0.501***
Short-term Leverage	0.519	0.263	0.000	1.327	0.557	0.540***	0.453***
Long-term Leverage	0.051	0.109	0.000	0.641	0.106	0.047***	0.027***
TFP^{LP}	4.037	2.087	0.806	15.0-03	3.642	3.799***	4.745***
TFP^{OP}	1.771	0.435	0.604	4.771	1.662	1.765***	1.853***
TFP^{OLS}	2.341	0.577	0.797	6.276	2.218	2.310***	2.482***
Profitability	0.130	0.316	−1.-326	2.584	0.049	0.168***	0.105***
No-debt Tax Shields	0.030	0.027	0.000	0.195	0.023	0.029	0.036***
Growth Opportunity	0.163	0.405	−0.-640	2.916	0.112	0.228***	0.189***
Volatility	0.199	0.506	−0.-751	3.712	0.055	0.205***	0.139***
Tangibility	0.888	0.155	0.299	1.408	0.880	0.884	0.903***
Size	10.0-29	1.330	7.182	14.1-20	10.4-29	9.687***	10.489***-
Age	2.222	0.793	0.000	3.989	2.949	2.090***	2.073***
SA Index	−3.-081	0.221	−3.-318	−1.-840	−3.-009	−3.129***	−3.039***
Observations					104,-868	347,799	170,073

Notes: See Appendix A for the precise definitions of the variables. This table reports the summary statistics for the sampled firms from 1999 to 2007 and tests comparing SOEs and private firms, and foreign firms. The significance of the test statistics for the equality of the variables' mean is shown by ***, **, and *, which represent statistical significance at the 1%, 5%, and 10% percent levels, respectively.

ownership.[19]

Table 3 shows the correlation coefficients of the key variables. All the correlation coefficients are less than 0.3 and most of them are very small, alleviating the concern of the multicollinearity problem when they are used simultaneously in the same regression.

5. Regression results

5.1. Baseline results and the importance of ownership in leverage decisions

Table 4 shows the estimation results of Eq. (1) and the test statistics. Table 5 presents the results when TFP is divided into high and low classifications. Columns 1–3, 4–6, and 7–9 show the results for the dependent variables of total leverage, short-term leverage, and long-term leverage, respectively. The results by state, private, and foreign ownership are also reported separately for each group.

First, TFP is significantly and positively associated with leverage measures of private and foreign firms, which is consistent with Hypothesis 1a. Furthermore, the relation between TFP and leverage is stronger for firms with a higher TFP than for firms with a lower TFP (Hypotheses 1b). Third, ownership appears to play an important and heterogeneous role in a firm's capital structure decisions (Hypothesis 1c).

Columns 1, 4, and 7 demonstrate that TFP is insignificantly associated with the leverage measures of SOEs. As state-owned lender decisions tend to be politically motivated (Sapienza, 2004; Dinç, 2005) and state ownership can facilitate a firm's access to debt (Dewenter and Malatesta, 2001; Khwaja and Mian, 2005), TFP cannot be a significant determinant of the capital structure choices of SOEs. In other words, the choice of leverage made by SOEs does not hinge upon their TFP level. However, columns 2, 5, and 8 (3, 6, and 9) in Table 6 show that TFP plays a significant and positive role on the leverage of private (foreign) firms. These results show that the leverage choice of private and foreign firms is positively related to TFP. Firms choose the appropriate level of leverage based on their TFP level. Table 7 confirms that a significant difference exists between higher TFP and lower TFP firms; higher TFP is associated with more leverage.

5.2. The importance of financial constraints in leverage decisions

Table 6 presents the estimation results of Eq. (3) and the test statistics, which are divided into high and low groups by financial

[19] Our results are consistent with previous studies (e.g., Chen and Guariglia, 2013) in that foreign and private firms have higher TFP and profitability.

Table 3
Correlation matrix between independent variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
TFP^{LP}	1									
TFP^{OP}	0.447	1								
TFP^{OLS}	0.565	0.981	1							
Profitability	0.000	−0.001	−0.-001	1						
Tax Shields	0.038	0.001	0.032	0.003	1					
Growth Opportunity	0.103	0.047	0.051	0.000	−0.-114	1				
Volatility	0.191	0.139	0.150	0.001	−0.-011	0.261	1			
Tangibility	−0.-078	−0.011	−0.-023	0.001	0.127	−0.283	−0.072	1		
Size	0.044	0.003	0.004	−0.-003	−0.-030	0.032	0.003	−0.-106	1.000	
Age	−0.-017	−0.059	−0.-047	−0.-003	−0.-034	−0.138	−0.126	0.000	0.129	1

Notes: See Appendix A for the precise definitions of the variables. This table reports the correlation matrix between independent variables of the sampled firms from 1999 to 20.

Table 4
Baseline results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage Measure	Total Leverage			Short-term Leverage			Long-term Leverage		
	State	Private	Foreign	State	Private	Foreign	State	Private	Foreign
L.Leverage	0.963***	0.846***	0.848***	0.950***	0.790***	0.833***	0.716***	0.691***	0.755***
	(0.027)	(0.023)	(0.027)	(0.021)	(0.024)	(0.020)	(0.043)	(0.016)	(0.030)
TFP	0.008	0.031***	0.015***	0.001	0.066***	0.012***	−0.001	0.005***	0.003*
	(0.007)	(0.010)	(0.004)	(0.003)	(0.013)	(0.004)	(0.003)	(0.002)	(0.002)
Profitability	−0.127-***	−0.331-***	−0.278-***	−0.095-**	−0.306-***	−0.222-***	−0.015	−0.014-**	−0.023-***
	(0.049)	(0.038)	(0.042)	(0.038)	(0.031)	(0.043)	(0.022)	(0.005)	(0.008)
Tax Shields	−0.681-**	−0.218	−0.553-**	0.270	−0.670-***	−0.626-***	0.016	−0.095-***	−0.003
	(0.305)	(0.471)	(0.225)	(0.293)	(0.154)	(0.152)	(0.027)	(0.027)	(0.010)
Growth Opportunity	−0.266-**	0.034	0.038	−0.019-***	−0.051-***	−0.033	−0.022-***	−0.011-***	−0.004
	(0.105)	(0.037)	(0.053)	(0.006)	(0.017)	(0.065)	(0.008)	(0.003)	(0.004)
Volatility	−0.028	0.189*	0.015***	0.004	0.366***	0.029	−0.009	0.041***	0.020
	(0.025)	(0.097)	(0.004)	(0.003)	(0.088)	(0.028)	(0.013)	(0.015)	(0.016)
Tangibility	0.280*	0.109	0.231	0.003	0.185*	0.101*	−0.112-**	0.002	−0.006-***
	(0.164)	(0.484)	(0.486)	(0.009)	(0.097)	(0.061)	(0.052)	(0.010)	(0.002)
Size	−0.004	−0.030-**	−0.010	0.001	−0.068-***	−0.004	−0.000	−0.002	−0.003
	(0.018)	(0.014)	(0.011)	(0.003)	(0.013)	(0.008)	(0.010)	(0.002)	(0.002)
Age	−0.023	0.013**	−0.020	−0.019	0.022***	−0.007	0.004*	0.005***	0.004
	(0.014)	(0.005)	(0.013)	(0.012)	(0.007)	(0.011)	(0.002)	(0.001)	(0.003)
Constant	−0.066	0.279	−0.028	0.061	0.320***	0.015	0.116	−0.003	0.022
	(0.235)	(0.599)	(0.527)	(0.037)	(0.098)	(0.084)	(0.129)	(0.013)	(0.017)
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
M(2)		0.607			0.638		0.245		
M(3)	0.339		0.210	0.539		0.318		0.155	0.254
Hansen (*J*) Test	0.707	0.133	0.250	0.229	0.281	0.182	0.173	0.547	0.386
Observations	62,557	269,647	126,403	63,156	272,524	129,237	62,877	266,147	129,814

Notes: See Appendix A for the precise definitions of the variables. This table presents the results from regressions using the two-step GMM model. *M(n)* is a test for the n-order serial correlation in the first-differenced residuals asymptotically distributed as N(0,1) under the null of no serial correlation. The Hansen (J) statistics are tested to overidentify restrictions distributed under the null of instrument validity. Robust standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% percent levels, respectively.

Table 5
Regressions with high and low TFP levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage Measure	Total Leverage			Short-term Leverage			Long-term Leverage		
	State	Private	Foreign	State	Private	Foreign	State	Private	Foreign
L.Leverage	0.958***	0.795***	0.862***	0.974***	0.830***	0.854***	0.740***	0.727***	0.764***
	(0.023)	(0.022)	(0.020)	(0.034)	(0.017)	(0.019)	(0.037)	(0.029)	(0.028)
TFP	0.018	0.149***	0.226***	0.000	0.120***	0.088***	−0.005	0.039**	0.013**
	(0.024)	(0.028)	(0.072)	(0.018)	(0.033)	(0.027)	(0.016)	(0.019)	(0.007)
TFP* Low	−0.024	−0.102***	−0.210***	0.005	−0.088***	−0.071**	0.003	−0.030**	−0.012*
	(0.026)	(0.031)	(0.072)	(0.019)	(0.032)	(0.028)	(0.018)	(0.014)	(0.007)
Dummy_TFP^{low}	0.057	0.260**	0.620***	−0.019	0.287***	0.228***	0.005	0.111**	0.033*
	(0.066)	(0.104)	(0.215)	(0.055)	(0.092)	(0.079)	(0.051)	(0.050)	(0.019)
Profitability	−0.119***	−0.262***	−0.345***	−0.136***	−0.197***	−0.287***	−0.005	−0.056**	−0.021***
	(0.038)	(0.051)	(0.037)	(0.052)	(0.019)	(0.033)	(0.023)	(0.026)	(0.007)
Tax Shields	−0.095*	−0.793***	−0.614***	0.039	−0.699***	−0.526***	−0.090**	0.057***	−0.003
	(0.050)	(0.202)	(0.062)	(0.069)	(0.110)	(0.054)	(0.045)	(0.019)	(0.010)
Growth Opportunity	−0.016***	−0.231***	−0.007	−0.006	−0.262***	0.027	−0.076**	0.036**	−0.002
	(0.006)	(0.080)	(0.027)	(0.006)	(0.051)	(0.026)	(0.036)	(0.017)	(0.001)
Volatility	0.002	0.017**	−0.000	0.004	0.016***	0.001	−0.025	0.116**	0.008*
	(0.003)	(0.009)	(0.005)	(0.004)	(0.004)	(0.002)	(0.018)	(0.051)	(0.004)
Tangibility	0.022	−0.233*	−0.002	0.003	−0.300***	0.090	−0.063**	−0.012***	−0.005*
	(0.014)	(0.135)	(0.116)	(0.018)	(0.059)	(0.111)	(0.027)	(0.003)	(0.003)
Size	0.013	−0.089***	−0.037***	−0.005	−0.079***	−0.031***	0.005*	−0.018*	0.000
	(0.010)	(0.033)	(0.007)	(0.011)	(0.011)	(0.007)	(0.003)	(0.010)	(0.004)
Age	−0.000	−0.033	−0.014***	0.002	−0.009	−0.009***	0.000	0.038**	0.001
	(0.002)	(0.029)	(0.003)	(0.002)	(0.008)	(0.003)	(0.002)	(0.018)	(0.001)
Constant	−0.124	0.985*	−0.138	0.086	0.868***	0.078	0.050	0.008	−0.031
	(0.130)	(0.518)	(0.207)	(0.123)	(0.135)	(0.112)	(0.044)	(0.025)	(0.039)
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
M(2)		0.085		0.627				0.204	
M(3)	0.888		0.475		0.108	0.791	0.511		0.133
Hansen (*J*) Test	0.140	0.931	0.132	0.370	0.278	0.074	0.212	0.303	0.434
Observations	62,557	269,647	126,403	63,156	272,524	126,877	62,877	271,147	129,814

Notes: See Appendix A for the precise definitions of the variables. This table presents the results from regressions using the two-step GMM model. *M(n)* is a test for the n-order serial correlation in the first-differenced residuals asymptotically distributed as N(0,1) under the null of no serial correlation. The Hansen (J) statistics are tested to overidentify restrictions distributed under the null of instrument validity. Robust standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% percent levels, respectively.

constraints. Columns 1, 4 and 7 demonstrate that TFP is insignificantly associated with the leverage measures of SOEs. The interaction between TFP and high-level financial constraints of private and foreign firms plays a significant and positive role on the three leverage measures. Firms with higher financial constraints must have a stronger relation between TFP and leverage measures compared to firms with low financial constraints, demonstrating that financial constraints are an important factor between TFP and leverage in Chinese firms. The higher the financial constraints of firms, the more sensitive the TFP is to the three leverage methods.

5.3. The importance of the institutional environment in leverage decisions

Table 7 shows the estimation results of Eq. (4) and the test statistics when the financial constraints faced by firms are divided into high and low classifications. First, consistent with the previous results, TFP is insignificantly associated with the leverage measures of SOEs. Second, the interaction between TFP and the underdeveloped institutional environment of private and foreign firms impacts the three leverage measures significantly and positively. Third, the relation between TFP and leverage depends on the institutional quality. When firms are in a well-developed institutional environment, TFP drives leverage more strongly, indicating that the institutional environment is an important indicator of the relation between TFP and leverage in Chinese firms. In an underdeveloped institutional environment, firms with high TFP levels must search for more leverage to overcome the poor financing due to underdeveloped institutions.

Table 6
Financial constraints for Chinese non-listed firms.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage Measure	Total Leverage			Short-term Leverage			Long-term Leverage		
	State	Private	Foreign	State	Private	Foreign	State	Private	Foreign
L.Leverage	0.953***	0.853***	0.788***	0.923***	0.790***	0.854***	0.708***	0.693***	0.759***
	(0.024)	(0.019)	(0.044)	(0.027)	(0.029)	(0.019)	(0.038)	(0.015)	(0.037)
TFP	−0.008	0.011**	0.014***	−0.002	0.042***	0.013***	0.003	0.002**	0.001
	(0.005)	(0.005)	(0.005)	(0.005)	(0.008)	(0.003)	(0.003)	(0.001)	(0.001)
TFP*FC^{high}	−0.001	0.064***	0.038***	−0.018	0.042***	0.012*	0.003	0.003*	0.010**
	(0.015)	(0.022)	(0.010)	(0.012)	(0.010)	(0.006)	(0.008)	(0.001)	(0.005)
Dummy_FC^{high}	0.029	−0.252***	−0.142***	0.092	−0.131***	−0.067**	−0.027	−0.018***	−0.041**
	(0.064)	(0.077)	(0.041)	(0.061)	(0.035)	(0.032)	(0.025)	(0.006)	(0.019)
Profitability	−0.129***	−0.332***	−0.204***	−0.086**	−0.314***	−0.279***	−0.015	−0.010**	−0.025**
	(0.040)	(0.033)	(0.059)	(0.044)	(0.032)	(0.034)	(0.020)	(0.005)	(0.012)
Tax Shields	−0.056	0.090	−0.892***	−0.023	−0.728***	−0.449***	−0.099***	0.013	−0.057
	(0.051)	(0.201)	(0.223)	(0.051)	(0.225)	(0.073)	(0.038)	(0.013)	(0.050)
Growth Opportunity	−0.014*	0.003	−0.109*	−0.006	0.007	0.045	−0.054**	−0.017***	−0.021*
	(0.007)	(0.025)	(0.065)	(0.007)	(0.017)	(0.042)	(0.026)	(0.006)	(0.011)
Volatility	−0.012	0.090	0.028***	−0.019	0.237***	0.006*	−0.002	−0.000	0.002
	(0.021)	(0.055)	(0.010)	(0.021)	(0.059)	(0.003)	(0.001)	(0.001)	(0.002)
Tangibility	0.037**	−0.332	0.274	0.027*	0.580*	0.061	−0.059**	−0.028***	0.037
	(0.017)	(0.324)	(0.190)	(0.015)	(0.324)	(0.223)	(0.025)	(0.006)	(0.061)
Size	0.031	−0.042***	−0.003	0.024	−0.031***	−0.018**	−0.013	−0.007***	−0.000
	(0.019)	(0.009)	(0.012)	(0.020)	(0.012)	(0.008)	(0.009)	(0.003)	(0.003)
Age	−0.006	0.012***	0.027***	−0.004	0.010***	0.005	0.006***	0.003***	0.003*
	(0.005)	(0.004)	(0.009)	(0.005)	(0.003)	(0.008)	(0.002)	(0.001)	(0.002)
Constant	−0.264	0.786**	−0.079	−0.231	−0.248	0.161	0.196*	0.101***	−0.022
	(0.202)	(0.326)	(0.226)	(0.214)	(0.397)	(0.170)	(0.108)	(0.028)	(0.071)
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
M(2)		0.384	0.237		0.238		0.853		
M(3)	0.918			0.283		0.513		0.167	0.319
Hansen (*J*) Test	0.378	0.059	0.116	0.211	0.057	0.259	0.217	0.970	0.357
Observations	62,557	269,647	126,403	63,156	272,524	126,877	62,877	271,147	129,814

Notes: See Appendix A for the precise definitions of the variables. This table presents the results from regressions using the two-step GMM model. *M(n)* is a test for n-order serial correlation in the first-differenced residuals, which are asymptotically distributed as N(0,1) under the null of no serial correlation. The Hansen (J) statistics are tested to overidentify restrictions distributed under the null of instrument validity. Robust standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% percent levels, respectively.

5.4. The importance of leverage costs in leverage decisions

Table 8 and Table 9 present the estimation results of Eq. (5) when the results of leverage costs by firms are divided into high and low groups. First, columns 1, 4, and 7 demonstrate that TFP is insignificantly associated with the leverage measures of SOEs. Second, the interactions between TFP and the high leverage costs of private and foreign firms influence the three leverage measures significantly and positively. Third, there is a significant difference between high leverage cost TFP and low leverage cost TFP. TFP drives leverage more strongly for firms facing high leverage cost. Alternatively, in the reform process, if firms have developed a close relationship with the government, which contributes to reducing their financing costs by decreasing repayment costs and bankruptcy risk, leverage in this case is not sensitive to the TFP level. Otherwise, this relationship is much stronger (Borisova and Megginson, 2011). Leverage cost is an important indicator that affects the relation between TFP and leverage in Chinese firms. When firms face higher leverage costs, TFP is more sensitive to leverage.

Furthermore, we discuss some other important findings in the estimations. First, profitability is significantly and negatively associated with the leverage measures, which is consistent with the pecking order theory and previous studies (Chen, 2004; Zou and Xiao, 2006; Bhabra et al., 2008; Li et al., 2009; Tsai et al., 2014). This result illustrates that profitable non-listed Chinese firms are more likely to secure internal financing via retained profits than less profitable ones. Second, non-debt tax shields are significantly and negatively associated with leverage measurements (Fama and French, 2002; DeAngelo and Masulis, 1980), which is consistent with the trade-off theory and previous studies (Huang and Song, 2006; Zou and Xiao, 2006; Qian et al., 2009; Chang et al., 2014).

Table 7
Institutional factors for Chinese non-listed firms.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage Measure	Total Leverage			Short-term Leverage			Long-term Leverage		
	State	Private	Foreign	State	Private	Foreign	State	Private	Foreign
L.Leverage	0.975***	0.855***	0.921***	0.942***	0.834***	0.841***	0.748***	0.697***	0.707***
	(0.030)	(0.022)	(0.035)	(0.031)	(0.022)	(0.019)	(0.033)	(0.019)	(0.022)
TFP	0.003	0.052***	0.037**	0.018	0.055***	0.021***	0.010	0.004**	0.003*
	(0.010)	(0.013)	(0.017)	(0.011)	(0.012)	(0.004)	(0.009)	(0.002)	(0.002)
TFP* Institution^{bad}	0.003	0.004**	0.011***	−0.015	0.004**	0.005**	−0.014	0.001**	0.001***
	(0.023)	(0.002)	(0.004)	(0.018)	(0.002)	(0.002)	(0.013)	(0.000)	(0.000)
Dummy_ Institution^{bad}	−0.003	−0.064	0.166	0.063	−0.038	−0.013	0.083	0.012	−0.014
	(0.112)	(0.101)	(0.102)	(0.090)	(0.105)	(0.060)	(0.069)	(0.032)	(0.047)
Profitability	−0.163***	−0.299***	−0.370***	−0.171***	−0.278***	−0.226***	−0.028	−0.027***	−0.025***
	(0.045)	(0.036)	(0.060)	(0.053)	(0.034)	(0.036)	(0.022)	(0.010)	(0.009)
Tax Shields	−0.109	−0.532***	−0.181	−0.021	−0.351**	−0.624***	−0.002	0.055**	0.030
	(0.098)	(0.168)	(0.524)	(0.075)	(0.174)	(0.106)	(0.036)	(0.022)	(0.021)
Growth Opportunity	−0.023	−0.125***	0.110	−0.013	−0.092**	−0.075	−0.007***	0.016	0.010
	(0.020)	(0.037)	(0.072)	(0.014)	(0.040)	(0.055)	(0.002)	(0.012)	(0.010)
Volatility	0.035	0.073	0.211**	0.022	0.022	0.045	−0.002	0.060***	0.022**
	(0.071)	(0.045)	(0.091)	(0.051)	(0.050)	(0.029)	(0.001)	(0.016)	(0.009)
Tangibility	0.007	0.125	0.033	0.009	−0.052	−0.031	−0.012***	0.013	0.005
	(0.009)	(0.116)	(0.446)	(0.009)	(0.118)	(0.066)	(0.004)	(0.010)	(0.010)
Size	−0.004	−0.065***	−0.058*	−0.004	−0.069***	−0.029***	0.004*	−0.006**	−0.004
	(0.010)	(0.014)	(0.032)	(0.007)	(0.013)	(0.006)	(0.002)	(0.003)	(0.003)
Age	0.001	0.004*	0.008	0.003	0.003	−0.005	0.003***	0.008***	0.004
	(0.004)	(0.002)	(0.011)	(0.003)	(0.003)	(0.009)	(0.001)	(0.002)	(0.003)
Constant	0.047	0.467***	0.414	−0.008	0.665***	0.000	−0.075	0.007	0.013
	(0.122)	(0.098)	(0.578)	(0.088)	(0.098)	(0.000)	(0.058)	(0.011)	(0.014)
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
M(3)	0.803	0.070	0.069	0.167	0.398	0.345	0.797	0.067	0.120
Hansen (*J*) Test	0.465	0.330	0.641	0.606	0.340	0.084	0.373	0.059	0.483
Observations	62,557	269,647	126,403	63,156	272,524	126,877	62,877	271,147	129,814

Notes: See Appendix A for the precise definitions of the variables. This table presents the results from regressions using the two-step GMM model. *M(n)* is a test for the n-order serial correlation in the first-differenced residuals asymptotically distributed as N(0,1) under the null of no serial correlation. The Hansen (J) statistics are tested to overidentify restrictions distributed under the null of instrument validity. Robust standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% percent levels, respective.

This is because non-debt tax shields are substitutes for the tax benefits of debt financing. Third, firm size plays a negative role on the leverage measures (Titman and Wessels, 1988), which is associated with the pecking order theory and previous studies (Chen, 2004; Tsai et al., 2014). This result shows that large firms face a lower degree of information asymmetry and consequently lower costs than small firms. Additionally, growth opportunity plays a negative role on the leverage measures (Long and Malitz, 1985), which is consistent with the trade-off theory and previous studies (Chen, 2004; Huang and Song, 2006; Zou and Xiao, 2006; Bhabra et al., 2008). Thus, we conclude that neither the pecking order theory nor the trade-off theory is perfectly suited to illustrate the case of Chinese non-listed firms.

6. Robustness tests

6.1. Alternative measurement of firm productivity

We use TFP estimated with the OP method and the OLS method as alternative measurements of firm productivity. Table 10a and Table 10b present the respective results. The coefficients on TFP^{op} are consistent with the ones on TFP^{lp}, indicating that the measurement of TFP does not change our results.

Table 8
Leverage cost factors for Chinese non-listed firms − interest fee.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage Measure	Total Leverage			Short-term Leverage			Long-term Leverage		
	State	Private	Foreign	State	Private	Foreign	State	Private	Foreign
L.Leverage	0.955***	0.773***	0.843***	0.990***	0.795***	0.825***	0.737***	0.364***	0.740***
	(0.024)	(0.013)	(0.019)	(0.046)	(0.012)	(0.022)	(0.033)	(0.007)	(0.028)
TFP	−0.006	0.010*	0.013***	−0.001	0.008**	0.016**	−0.000	−0.001	0.000
	(0.006)	(0.005)	(0.004)	(0.012)	(0.003)	(0.008)	(0.003)	(0.001)	(0.001)
TFP*IE^{high}	0.002	0.023***	0.023***	0.003	0.011***	0.018***	0.001	0.001**	0.004*
	(0.008)	(0.005)	(0.006)	(0.019)	(0.004)	(0.006)	(0.004)	(0.000)	(0.002)
Dummy_IE^{high}	0.019	−0.106***	−0.129***	0.014	−0.023	−0.106***	−0.006	−0.005***	−0.019
	(0.038)	(0.019)	(0.029)	(0.093)	(0.020)	(0.032)	(0.014)	(0.002)	(0.012)
Profitability	−0.122***	−0.188***	−0.309***	−0.143**	−0.178***	−0.255***	−0.030	0.011***	−0.017**
	(0.040)	(0.015)	(0.035)	(0.057)	(0.014)	(0.038)	(0.021)	(0.001)	(0.008)
Tax Shields	−0.120**	−0.328***	−0.479***	0.036	−0.269***	−0.564***	−0.042	0.065***	0.005
	(0.052)	(0.054)	(0.089)	(0.083)	(0.047)	(0.189)	(0.053)	(0.008)	(0.023)
Growth Opportunity	−0.012*	−0.105***	0.027	0.002	−0.047**	−0.008	−0.036	−0.003***	−0.003
	(0.007)	(0.024)	(0.041)	(0.010)	(0.020)	(0.092)	(0.033)	(0.001)	(0.010)
Volatility	0.003	0.125***	0.011	−0.019	0.049***	−0.038	−0.005	0.001**	0.009
	(0.020)	(0.020)	(0.031)	(0.035)	(0.014)	(0.084)	(0.015)	(0.000)	(0.009)
Tangibility	0.020	−0.126***	−0.014	−0.001	−0.031	−0.011	−0.059***	−0.024***	−0.019
	(0.018)	(0.026)	(0.066)	(0.026)	(0.021)	(0.157)	(0.014)	(0.002)	(0.018)
Size	0.011	−0.036***	−0.030***	−0.001	−0.024***	−0.033**	0.002	−0.004***	−0.001
	(0.014)	(0.006)	(0.007)	(0.019)	(0.003)	(0.017)	(0.003)	(0.001)	(0.002)
Age	−0.001	−0.006***	−0.018***	0.001	−0.003**	−0.020***	0.003**	0.006***	−0.000
	(0.003)	(0.001)	(0.004)	(0.004)	(0.001)	(0.006)	(0.001)	(0.000)	(0.001)
Constant	−0.078	0.000	0.000	0.022	0.386***	0.452	0.056	0.068***	0.000
	(0.134)	(0.000)	(0.000)	(0.185)	(0.050)	(0.378)	(0.036)	(0.012)	(0.000)
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
M(2)				0.427					
M(3)	0.892	0.564	0.384		0.190	0.377	0.460	0.155	0.779
Hansen (*J*) Test	0.130	0.657	0.220	0.162	0.158	0.240	0.359	0.162	0.090
Observations	62,557	269,647	126,403	63,156	272,524	126,877	62,877	271,147	129,814

Notes: See Appendix for the precise definitions of the variables. This table presents the results from regressions using the two-step GMM model. *M(n)* is a test for the n-order serial correlation in the first-differenced residuals asymptotically distributed as N(0,1) under the null of no serial correlation. The Hansen (J) statistics are tested to overidentify restrictions distributed under the null of instrument validity. Robust standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% percent levels, respectively.

6.2. Alternative measurement of the financial constraint index

We use the Whited and Wu index, also called the WW index[20] (Whited and Wu, 2006), as an alternative measurement of the financial constraint indicator (the SA index in this paper). We adopt the WW index as a financial constraints indicator in Eq. (3), and the estimators are presented in Table 11. The results are consistent with those in Table 6, indicating that our results are unlikely to be driven by the particular measure of financial constraints.

6.3. Formal and informal financing

It is well recognized that formal financing (e.g., bank financing) and informal financing (e.g., trade credit) are important measures

[20] The WW index is denoted as −0.091*CF-0.062*DIVPOS + 0.021*TLTD-0.044*LNTA + 0.102*ISG-0.035*SG, where CF is the cash flow divided by total assets; TLTD is long-term debt-to-total assets; LNTA is the logarithm of total assets; ISG is industry level's sales growth; SG is firm level's sales growth; DIVPOS is a dividend dummy. However, due to our database, the dividend variable is unavailable. Thus, we omitted this variable from our WW index.

Table 9
Leverage cost factors for Chinese non-listed firms − finance fee.

	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)
Leverage Measure	Total Leverage			Short-term Leverage			Long-term Leverage		
	State	Private	Foreign	State	Private	Foreign	State	Private	Foreign
L.Leverage	0.962***	0.858***	0.823***	0.944***	0.796***	0.842***	0.743***	0.682***	0.748***
	(0.025)	(0.020)	(0.034)	(0.030)	(0.023)	(0.029)	(0.033)	(0.017)	(0.028)
TFP	−0.006	0.020**	0.022***	0.005	0.060***	0.016*	−0.001	0.007***	0.006**
	(0.010)	(0.008)	(0.006)	(0.008)	(0.012)	(0.010)	(0.004)	(0.002)	(0.003)
TFP* FE^{high}	0.007	0.016***	0.008***	0.006**	0.006***	0.011***	0.001	0.002***	0.001**
	(0.014)	(0.004)	(0.002)	(0.003)	(0.002)	(0.004)	(0.001)	(0.000)	(0.001)
Dummy_ FE^{high}	0.017	−0.422***	−0.135	0.076	−0.133	−0.040	−0.083**	−0.018	−0.024
	(0.078)	(0.094)	(0.213)	(0.156)	(0.117)	(0.088)	(0.037)	(0.014)	(0.021)
Profitability	−0.151***	−0.275***	−0.453***	−0.122**	−0.306***	−0.322**	−0.027	−0.013**	−0.032***
	(0.045)	(0.031)	(0.070)	(0.047)	(0.030)	(0.130)	(0.021)	(0.006)	(0.012)
Tax Shields	−0.145**	0.241	−0.414***	−0.099	−0.691***	−0.409***	−0.036	0.000	−0.004
	(0.068)	(0.219)	(0.045)	(0.062)	(0.119)	(0.095)	(0.034)	(0.017)	(0.021)
Growth Opportunity	−0.020**	−0.025	0.055***	−0.020*	−0.040***	−0.126***	−0.006	−0.022***	−0.002
	(0.009)	(0.031)	(0.014)	(0.011)	(0.015)	(0.027)	(0.008)	(0.007)	(0.009)
Volatility	0.038	0.063	0.090**	0.059	0.332***	0.000	−0.004	0.074***	0.011
	(0.034)	(0.081)	(0.043)	(0.045)	(0.082)	(0.018)	(0.031)	(0.025)	(0.008)
Tangibility	0.017	−0.692*	−0.020*	−0.009	0.213**	0.181	−0.011**	−0.017***	−0.009
	(0.022)	(0.372)	(0.010)	(0.026)	(0.088)	(0.129)	(0.005)	(0.003)	(0.008)
Size	0.007	−0.050***	−0.023***	−0.020	−0.065***	−0.021	0.003	−0.005**	−0.007
	(0.017)	(0.013)	(0.008)	(0.021)	(0.012)	(0.013)	(0.004)	(0.002)	(0.004)
Age	0.000	0.006	−0.185**	0.007	0.020***	0.045	0.004*	0.007***	0.003
	(0.004)	(0.005)	(0.078)	(0.004)	(0.006)	(0.042)	(0.002)	(0.002)	(0.002)
Constant	−0.056	1.252*	0.618***	0.204	0.282***	0.150	−0.005	0.022*	0.038*
	(0.156)	(0.726)	(0.155)	(0.199)	(0.102)	(0.234)	(0.023)	(0.012)	(0.023)
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
M(2)					0.110				
M(3)	0.708	0.415	0.545	0.080		0.449	0.642	0.229	0.185
Hansen (*J*) Test	0.158	0.120	0.114	0.142	0.241	0.084	0.497	0.740	0.320
Observations	62,557	269,647	126,403	63,156	272,524	126,877	62,877	271,147	129,814

Notes: This table presents the results from regressions using the two-step GMM model. *M(n)* is a test for the n-order serial correlation in the first-differenced residuals asymptotically distributed as N(0,1) under the null of no serial correlation. The Hansen (J) statistics are tested to overidentify restrictions distributed under the null of instrument validity. Robust standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% percent levels, respectively.

of leverage financing in Chinese enterprises. To test whether TFP is also a determinant of formal and informal financing, we discuss the relation between TFP and bank loans and that between TFP and trade credit.

$$Finance_{it} = \alpha_0 + \alpha_1 Finance_{i,t-1} + \alpha_2 TFP_{it} + \alpha_3 X_{it} + v_i + v_j + v_t + v_{jt} + \varepsilon_{it} \quad 9)$$

Finance indicates bank financing and trade credit. *Finance* here is measured in two ways. First, *Finance* is a dummy variable that is equal to 1 if firms gain access to bank financing (trade credit) and 0 otherwise. We use IV-Tobit to regress our estimation to solve the endogeneity problem. Second, *Finance* indicates when firms have access to bank financing (trade credit). We use GMM to regress our estimation. Bank financing and trade credit are denoted by interest over total assets and account for payable over total assets separately.

Table 12 and Table 13 present the estimation results of Eq. (9) for bank financing and trade credit, respectively. TFP is insignificantly associated with both bank financing and trade credit of SOEs, but significantly impacts both bank financing and trade credit of private and foreign enterprises.

7. Conclusions

This study offers new evidence that TFP influences firms' capital structure choices. Using a database of Chinese non-listed enterprises (GTA non-listed enterprises database) that covers records of 118,365 firms from 1998 to 2007, we show that the capital

Table 10a
Alternative measurement of firm productivity: TFP measured with the *OP* method.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage Measure	Total Leverage			Short-term Leverage			Long-term Leverage		
	State	Private	Foreign	State	Private	Foreign	State	Private	Foreign
L.Leverage	0.972***	0.828***	0.863***	0.932***	0.843***	0.846***	0.784***	0.702***	0.744***
	(0.030)	(0.030)	(0.020)	(0.030)	(0.028)	(0.020)	(0.026)	(0.015)	(0.028)
TFP^{op}	−0.015	0.347***	0.075***	0.019	0.309***	0.051*	−0.005	0.023**	0.016*
	(0.030)	(0.061)	(0.025)	(0.047)	(0.063)	(0.027)	(0.015)	(0.010)	(0.009)
Profitability	−0.192***	−0.299***	−0.258***	−0.144***	−0.268***	−0.234***	−0.013	−0.010**	−0.019***
	(0.046)	(0.025)	(0.045)	(0.045)	(0.024)	(0.037)	(0.010)	(0.005)	(0.007)
Tax Shields	−0.075	−0.184*	−0.685***	−0.048	−0.177**	−0.549***	−0.039	0.039***	0.000
	(0.059)	(0.097)	(0.225)	(0.067)	(0.089)	(0.202)	(0.025)	(0.009)	(0.010)
Growth Opportunity	−0.015	−0.081***	−0.053	−0.007	−0.068***	0.023	−0.007	−0.008**	−0.006
	(0.011)	(0.017)	(0.087)	(0.017)	(0.017)	(0.074)	(0.006)	(0.003)	(0.004)
Volatility	−0.004	0.379***	0.070*	−0.001	0.326***	0.042	0.002	0.023**	0.023
	(0.039)	(0.072)	(0.041)	(0.056)	(0.075)	(0.047)	(0.018)	(0.011)	(0.015)
Tangibility	0.032*	0.007	0.073	0.017**	0.016	0.178	−0.012***	−0.008***	−0.004**
	(0.018)	(0.011)	(0.119)	(0.008)	(0.010)	(0.159)	(0.003)	(0.001)	(0.002)
Size	0.016	−0.006***	−0.009	0.002***	−0.005***	0.010	0.002***	0.002***	0.001**
	(0.012)	(0.002)	(0.006)	(0.001)	(0.002)	(0.006)	(0.000)	(0.000)	(0.000)
Age	−0.006	0.029***	0.005	0.002	0.025***	0.001	0.004**	0.003***	0.003
	(0.004)	(0.008)	(0.016)	(0.004)	(0.008)	(0.013)	(0.002)	(0.001)	(0.002)
Constant	−0.109	−0.612***	−0.011	−0.013	−0.492***	−0.267	0.012	−0.049**	−0.039*
	(0.105)	(0.156)	(0.197)	(0.102)	(0.131)	(0.228)	(0.035)	(0.022)	(0.021)
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
M(3)	0.958	0.251	0.201	0.136	0.481	0.129	0.913	0.305	0.630
Hansen (*J*) Test	0.274	0.140	0.163	0.314	0.138	0.303	0.495	0.143	0.255
Observations	62,357	268,462	126,074	63,281	271,313	128,875	63,067	269,956	129,431

Notes: See Appendix A for the precise definitions of the variables. This table presents the results from regressions using the two-step GMM model. *M(n)* is a test for n-order serial correlation in the first-differenced residuals asymptotically distributed as N(0,1) under the null of no serial correlation. The Hansen (J) statistics are tested to overidentify restrictions distributed under the null of instrument validity. Robust standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% percent levels, respectively.

Table 10b
Alternative measurement of firm productivity: TFP measured with the *OLS* method.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage Measure	Total Leverage			Short-term Leverage			Long-term Leverage		
	State	Private	Foreign	State	Private	Foreign	State	Private	Foreign
L.Leverage	0.963***	0.827***	0.873***	0.929***	0.851***	0.845***	0.783***	0.701***	0.746***
	(0.028)	(0.050)	(0.019)	(0.030)	(0.029)	(0.020)	(0.026)	(0.019)	(0.028)
TFP^{ols}	−0.010	0.325***	0.060***	0.013	0.240***	0.037*	−0.003	0.030*	0.012*
	(0.031)	(0.079)	(0.019)	(0.032)	(0.048)	(0.020)	(0.011)	(0.018)	(0.007)
Profitability	−0.179***	−0.380***	−0.285***	−0.145***	−0.277***	−0.235***	−0.012	−0.038*	−0.020***
	(0.043)	(0.056)	(0.041)	(0.045)	(0.026)	(0.038)	(0.010)	(0.020)	(0.007)
Tax Shields	−0.076	−0.553	−0.538***	−0.054	−0.283***	−0.563***	−0.039	−0.091**	−0.007
	(0.067)	(0.613)	(0.167)	(0.072)	(0.094)	(0.202)	(0.028)	(0.039)	(0.010)
Growth Opportunity	−0.015	0.056	0.009	−0.007	−0.069***	0.026	−0.008	0.029	−0.005
	(0.016)	(0.034)	(0.067)	(0.016)	(0.017)	(0.072)	(0.006)	(0.024)	(0.004)
Volatility	0.005	0.448***	0.074*	0.001	0.332***	0.031	0.005	0.045*	0.021
	(0.053)	(0.120)	(0.039)	(0.055)	(0.077)	(0.045)	(0.019)	(0.027)	(0.014)
Tangibility	0.013*	0.735	0.034	0.017**	−0.002	0.160	−0.012-	0.026	−0.004-

(continued on next page)

Table 10b *(continued)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage Measure	Total Leverage			Short-term Leverage			Long-term Leverage		
	State	Private	Foreign	State	Private	Foreign	State	Private	Foreign
							***		**
	(0.007)	(1.008)	(0.110)	(0.008)	(0.011)	(0.156)	(0.003)	(0.024)	(0.002)
Size	0.001	−0.017	−0.010**	0.001	−0.022***	0.006	0.002***	−0.004	−0.000
	(0.002)	(0.041)	(0.005)	(0.002)	(0.005)	(0.006)	(0.001)	(0.004)	(0.001)
Age	−0.001	0.037***	0.016	0.002	0.026***	0.000	0.004**	0.009**	0.002
	(0.003)	(0.013)	(0.014)	(0.004)	(0.008)	(0.013)	(0.002)	(0.004)	(0.002)
Constant	0.047	−1.283	−0.020	−0.021	−0.326***	−0.209	0.006	−0.090*	−0.025*
	(0.069)	(1.211)	(0.168)	(0.075)	(0.097)	(0.210)	(0.026)	(0.050)	(0.013)
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
M(3)	0.937	0.602	0.204	0.154	0.662	0.110	0.930	0.188	0.655
Hansen (*J*) Test	0.329	0.295	0.131	0.375	0.176	0.301	0.484	0.309	0.280
Observations	62,686	268,472	126,067	63,288	271,322	128,868	63,066	269,965	129,431

Notes: See Appendix A for the precise definitions of the variables. This table presents the results from regressions using the two-step GMM model. *M(n)* is a test for n-order serial correlation in the first-differenced residuals asymptotically distributed as N(0,1) under the null of no serial correlation. The Hansen (J) statistics are tested to overidentify restrictions distributed under the null of instrument validity. Robust standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% percent levels, respectively.

Table 11
Alternative measurement of financial constraints: FC measured with the WW Index.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Leverage Measure	Total Leverage			Short-term Leverage			Long-term Leverage		
	State	Private	Foreign	State	Private	Foreign	State	Private	Foreign
L.Leverage	0.965***	0.817***	0.863***	0.960***	0.828***	0.825***	0.704***	0.690***	0.736***
	(0.024)	(0.019)	(0.022)	(0.038)	(0.022)	(0.028)	(0.042)	(0.016)	(0.026)
TFP	0.001	0.044***	0.035***	0.025	0.043**	0.015*	−0.007	0.001	0.002
	(0.003)	(0.015)	(0.012)	(0.020)	(0.021)	(0.009)	(0.013)	(0.002)	(0.003)
TFP* FC^{high}	−0.000	0.053**	0.020**	−0.073	0.087**	0.056**	0.012	0.012**	0.007*
	(0.015)	(0.025)	(0.008)	(0.069)	(0.043)	(0.028)	(0.036)	(0.006)	(0.004)
Dummy_FC^{high}	0.019	0.012	−0.267	0.260	−0.118	−0.062	−0.029	−0.038*	−0.026
	(0.069)	(0.226)	(0.487)	(0.216)	(0.340)	(0.184)	(0.180)	(0.021)	(0.036)
Profitability	−0.169***	−0.331***	−0.345***	−0.119**	−0.336***	−0.178***	−0.006	−0.007	−0.018*
	(0.041)	(0.052)	(0.036)	(0.056)	(0.074)	(0.064)	(0.024)	(0.006)	(0.010)
Tax Shields	−0.049	−0.221***	−0.581***	0.070	−0.260***	−0.773***	−0.016	−0.036*	0.005
	(0.052)	(0.053)	(0.066)	(0.107)	(0.072)	(0.213)	(0.059)	(0.021)	(0.009)
Growth Opportunity	−0.011*	−0.036*	0.012	−0.039**	−0.034	−0.066	−0.015**	−0.046***	0.001
	(0.006)	(0.021)	(0.029)	(0.019)	(0.027)	(0.082)	(0.007)	(0.011)	(0.003)
Volatility	0.006	0.213***	0.011	0.019	0.278***	−0.066	0.034	−0.021**	0.006
	(0.008)	(0.081)	(0.028)	(0.056)	(0.107)	(0.059)	(0.032)	(0.009)	(0.009)
Tangibility	0.012	−0.029***	0.028	−0.175*	−0.020	0.218**	−0.011*	−0.061***	−0.007**
	(0.007)	(0.011)	(0.118)	(0.100)	(0.013)	(0.090)	(0.006)	(0.013)	(0.003)
Size	0.004	0.004	−0.022**	−0.016	0.020	0.046	0.011	−0.006	0.003
	(0.010)	(0.014)	(0.010)	(0.039)	(0.028)	(0.031)	(0.016)	(0.008)	(0.007)
Age	0.013	−0.058**	−0.009	0.001	−0.022***	−0.044**	0.005	−0.006	0.001
	(0.013)	(0.026)	(0.007)	(0.006)	(0.007)	(0.019)	(0.003)	(0.004)	(0.002)
Constant	−0.066	−0.043	0.149	0.221	−0.462	0.000	−0.063	0.146*	−0.044
	(0.109)	(0.152)	(0.151)	(0.431)	(0.354)	(0.000)	(0.248)	(0.088)	(0.065)
Year Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES

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Table 11 *(continued)*

Leverage Measure	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Total Leverage			Short-term Leverage			Long-term Leverage		
	State	Private	Foreign	State	Private	Foreign	State	Private	Foreign
M(3)	0.954	0.897	0.554	0.258	0.246	0.270	0.221	0.431	0.132
Hansen (*J*) Test	0.213	0.060	0.248	0.223	0.133	0.205	0.550	0.510	0.230
Observations	62,557	269,647	126,403	63,156	272,524	126,877	62,877	271,147	129,814

Notes: See Appendix A for the precise definitions of the variables. This table presents the results from regressions using the two-step GMM model. *M(n)* is a test for n-order serial correlation in the first-differenced residuals asymptotically distributed as N(0,1) under the null of no serial correlation. The Hansen (J) statistics are tested to overidentify restrictions distributed under the null of instrument validity. Robust standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5% and 10% percent level, respectively.

Table 12
Tests for formal financing.

Dependent Variable: Bank Finance						
	(1)	(2)	(3)	(4)	(5)	(6)
	System GMM			IV-Tobit		
	State	Private	Foreign	State	Private	Foreign
L.Bank	0.6033***	0.7228***	0.7455***	0.6687***	0.6636***	0.6769***
	(0.1895)	(0.0540)	(0.1047)	(0.0032)	(0.0018)	(0.0024)
TFP	0.0006	0.0010***	0.0004*	0.0001	0.0006***	0.0003***
	(0.0005)	(0.0003)	(0.0002)	(0.0000)	(0.0001)	(0.0001)
Profitability	−0.0017	−0.0012	−0.0037	0.0007***	−0.0004**	−0.0005**
	(0.0045)	(0.0013)	(0.0026)	(0.0001)	(0.0002)	(0.0002)
Tax Shields	−0.0307	−0.0112***	−0.0018	0.0165***	−0.0041***	−0.0038***
	(0.0400)	(0.0029)	(0.0012)	(0.0018)	(0.0011)	(0.0008)
Growth Opportunity	−0.0050***	−0.0062***	−0.0021***	−0.0035***	−0.0041***	−0.0019***
	(0.0011)	(0.0006)	(0.0006)	(0.0002)	(0.0001)	(0.0001)
Volatility	0.0038	0.0086***	0.0011	0.0003***	0.0015***	0.0006***
	(0.0033)	(0.0024)	(0.0018)	(0.0001)	(0.0001)	(0.0001)
Tangibility	0.0031***	0.0004	0.0005	0.0018***	0.0006***	−0.0001
	(0.0006)	(0.0004)	(0.0004)	(0.0003)	(0.0002)	(0.0002)
Size	0.0001	−0.0001	−0.0002	0.0005***	−0.0001	−0.0001
	(0.0004)	(0.0005)	(0.0003)	(0.0001)	(0.0001)	(0.0001)
Age	0.0006	−0.0019	−0.0018	0.0000	−0.0000	−0.0007***
	(0.0018)	(0.0015)	(0.0033)	(0.0001)	(0.0000)	(0.0001)
Constant	−0.0014	0.0035**	0.0070	−0.0038***	0.0051***	0.0055***
	(0.0080)	(0.0017)	(0.0096)	(0.0006)	(0.0009)	(0.0011)
Year Dummy	YES	YES	YES	YES	YES	YES
Industry Dummy	YES	YES	YES	YES	YES	YES
M(2)	0.103	0.484				
M(3)			0.836			
Hansen (*J*) Test	0.764	0.812	0.061			
Wald Test				0.0158	0.0000	0.0000
Observations	49,133	177,847	103,624	49,133	177,847	103,624

Notes: See Appendix A for the precise definitions of the variables. Columns 1–3 present the results from regressions using the two-step GMM model. *M(n)* is a test for n-order serial correlation in the first-differenced residuals asymptotically distributed as N(0,1) under the null of no serial correlation. The Hansen (J) statistics are tested to overidentify restrictions distributed under the null of instrument validity. Columns 4–6 present the results from regressions using the IV-Tobit model. Two period lags of TFP are used as instrument variables. The numbers in the rows of Wald tests indicate whether TFP in these regressions is endogenous or not. Robust standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% percent levels, respectively.

structure is determined by TFP and that TFP is an efficient signal of the leverage market for Chinese non-listed firms.

First, the results show that TFP is significantly and positively related to the leverage measures (total, short-term and long-term leverages) for private and foreign enterprises, but insignificantly for SOEs. There is also a significant difference between the behavior of firms with higher and lower TFP regarding capital structure choices; the higher the TFP, the greater the leverage of firms.

Second, by using the SA index to measure the financial constraints faced by firms, we show that financial constraints affect the relation between TFP and measures of leverage significantly. The difference of leverage between the behaviors of enterprises with high and low financial constraints is significant. The leverage sensitivity driven by TFP is larger for enterprises that are highly

Table 13
Tests for informal financing.

Dependent Variable: Trade Credit						
	(1)	(2)	(3)	(4)	(5)	(6)
	System GMM			IV-Tobit		
	State	Private	Foreign	State	Private	Foreign
L.Trade Credit	0.8839***	0.7265***	0.7465***	0.7115***	0.6292***	0.6956***
	(0.0800)	(0.0295)	(0.0288)	(0.0072)	(0.0022)	(0.0032)
TFP	0.0025	0.0051***	0.0043*	−0.0006	0.0030***	0.0026***
	(0.0037)	(0.0016)	(0.0022)	(0.0013)	(0.0005)	(0.0007)
Profitability	−0.0653	−0.0602***	−0.0837***	0.0067	−0.0298***	−0.0409***
	(0.0529)	(0.0150)	(0.0183)	(0.0067)	(0.0025)	(0.0088)
Tax Shields	0.0182	−0.2767*	−0.2268***	0.0426	−0.0828***	−0.2078***
	(0.0418)	(0.1469)	(0.0705)	(0.0472)	(0.0117)	(0.0186)
Growth Opportunity	0.0051	0.0326	−0.0484***	0.0320*	−0.0031***	−0.0037**
	(0.0051)	(0.0299)	(0.0043)	(0.0187)	(0.0009)	(0.0015)
Volatility	0.0069**	0.0017	0.0126***	−0.0897	0.0039***	0.0008
	(0.0032)	(0.0038)	(0.0019)	(0.0607)	(0.0008)	(0.0013)
Tangibility	0.0074	0.0376	0.0502*	0.0188***	0.0165***	0.0168***
	(0.0085)	(0.0252)	(0.0286)	(0.0061)	(0.0022)	(0.0039)
Size	−0.0013	−0.0123***	−0.0037	0.0011	−0.0072***	−0.0008
	(0.0039)	(0.0032)	(0.0032)	(0.0015)	(0.0006)	(0.0011)
Age	0.0010	0.0023	0.0048	−0.0033	−0.0009*	−0.0000
	(0.0014)	(0.0019)	(0.0051)	(0.0020)	(0.0006)	(0.0014)
Constant	0.0193	0.1113***	0.0163	0.0150	0.0854***	0.0611***
	(0.0345)	(0.0145)	(0.0439)	(0.0117)	(0.0055)	(0.0118)
Year Dummy	YES	YES	YES	YES	YES	YES
Industry Dummy	YES	YES	YES	YES	YES	YES
M(3)	0.051	0.105	0.130			
Hansen (*J*) Test	0.501	0.260	0.087			
Wald Test				0.0884	0.0000	0.0000
Observations	13,659	124,285	52,313	13,659	124,285	52,313

Notes: See Appendix A for the precise definitions of the variables. Columns 1–3 present the results from regressions using the two-step GMM model. *M(n)* is a test for n-order serial correlation in the first-differenced residuals asymptotically distributed as N(0,1) under the null of no serial correlation. The Hansen (J) statistics are tested to overidentify restrictions distributed under the null of instrument validity. Columns 4–6 present the results from regressions using the IV-Tobit model. Two period lags of TFP are used as instrument variables. The numbers in the rows of Wald tests indicate whether TFP in these regressions is endogenous or not. Robust standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% percent levels, respectively.

financially constrained. Our results are also stable when financial constraints are measured by the WW index.

Third, the institutional environment also influences the relation between TFP and leverage measures. An underdeveloped institutional environment makes firms with high TFP demand more leverage because it prevents healthy financing for firms.

Fourth, we further suggest that there is a significant difference in the leverage structure between high and low costs of leverage. Firms prefer to afford the relatively high cost of leverage when TFP is more sensitive to leverage.

Finally, we also confirm that TFP is a determinant of formal financing (e.g., bank financing) and informal financing (e.g., trade credit) choices. In conclusion, this paper provides evidence that TFP is an important determinant of the capital structure choices of non-listed Chinese firms.

Appendix A

Variable Definitions.

Total Leverage	Total Debt Divided by Total Assets
Short-term Leverage	Short-term Debt Divided by Total Assets
Long-term Leverage	Long-term Debt Divided by Total Assets.
TFP^{lp}	Total Factor Productivity, measured by Levinsohn and Petrin (2003)
TFP^{op}	Total Factor Productivity, measured by Olley and Pakes (1996)
TFP^{ols}	Total Factor Productivity, measured by Jefferson et al. (2008)
Growth Opportunity	Proportion of Change in Assets from Year t-2 to Year t-1.
Volatility	Change in Revenues from Year t-2 to Year t-1 Divided by Total Assets.

Profitability	Return on Assets, Measured by Net Profit Divided by Equity
Firm Size	Natural Logarithm of Total Assets
Firm Age	Natural Logarithm of the Number of Years Since the Open Year
Interest Fee	Interest Expenses Divided by Total Leverage
Finance Fee	Finance Expenses Divided by Total Leverage
Bank Finance	Interest Expenses Divided by Total Assets
Trade Credit	Account of Payables Divided by Total Assets
SA Index	$1\text{-}0.737*Size+0.043*Size^2\text{-}0.040*Age$
WW Index	2-0.091*CF-0.062*DIVPOS + 0.021*TLTD-0.044*LNTA + 0.102*ISG-0.035*SG

References

İmrohoroğlu, A., Tüzel, Ş., 2014. Firm-level productivity, risk, and return. Manage. Sci. 60 (8), 2073–2090.
Ades, A., Di Tella, R., 1999. Rents, competition, and corruption. Am. Econ. Rev. 982–993.
Anderson, R.C., Reeb, D.M., 2003. Founding-family ownership and firm performance: evidence from the S & P 500. J. Finance 1301–1328.
Arellano, M., Bond, S., 1991. Some tests of specification for panel data: monte Carlo evidence and an application to employment equations. Rev. Econ. Stud. 58 (2), 277–297.
Baskin, J., 1989. An empirical investigation of the pecking order hypothesis. Financial Manage. 26–35.
Becker, B., Sivadasan, J., 2010. The effect of financial development on the investment-cash flow relationship: cross-country evidence from Europe. BE J. Econ. Anal. Policy 10 (1).
Benito, A., Hernando, I., 2007. Firm behaviour and financial pressure: evidence from spanish panel data. Bull. Econ. Res. 59 (4), 283–311.
Berger, A.N., Bonaccorsi di Patti, E., 2006. Capital structure and firm performance: a new approach to testing agency theory and an application to the banking industry. J. Banking Finance 30 (4), 1065–1102.
Berger, A.N., Hasan, I., Zhou, M., 2009. Bank ownership and efficiency in China: what will happen in the world's largest nation? J. Banking Finance 33 (1), 113–130.
Bevan, A.A., Danbolt, J., 2002. Capital structure and its determinants in the UK-a decompositional analysis. Appl. Financial Econ. 12 (3), 159–170.
Bhabra, H.S., Liu, T., Tirtiroglu, D., 2008. Capital structure choice in a nascent market: evidence from listed firms in China. Financial Manage. 37 (2), 341–364.
Bliss, M.A., Gul, F.A., 2012. Political connection and leverage: some Malaysian evidence. J. Banking Finance 36 (8), 2344–2350.
Blundell, R., Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. J. Econometrics 87 (1), 115–143.
Blundell, R., Bond, S., 2000. GMM estimation with persistent panel data: an application to production functions. Econometric Rev. 19 (3), 321–340.
Boerner, K., Hainz, C., 2009. The political economy of corruption and the role of economic opportunities1. Econ. Transition 17 (2), 213–240.
Bond, S.R., 2002. Dynamic panel data models: a guide to micro data methods and practice. Portuguese Econ. J. 1 (2), 141–162.
Booth, L., Aivazian, V., Demirguc-Kunt, A., Maksimovic, V., 2001. Capital structures in developing countries. J. Finance 87–130.
Borisova, G., Megginson, W.L., 2011. Does government ownership affect the cost of debt? evidence from privatization. Review of Financial Studies. (hhq154).
Bradley, M., Jarrell, G.A., Kim, E., 1984. On the existence of an optimal capital structure: theory and evidence. J. Finance 39 (3), 857–878.
Brandt, L., Li, H., 2003. Bank discrimination in transition economies: ideology, information, or incentives? J. Comp. Econ. 31 (3), 387–413.
Brandt, L., Van Biesebroeck, J., Zhang, Y., 2012. Creative accounting or creative destruction? Firm-level productivity growth in Chinese manufacturing. J. Dev. Econ. 97 (2), 339–351.
Brown, J.R., Petersen, B.C., 2009. Why has the investment-cash flow sensitivity declined so sharply? Rising R & D and equity market developments. J. Banking Finance 33 (5), 971–984.
Cai, H., Fang, H., Xu, L., 2011. Eat, drink, firms and governments: an investigation of corruption from entertainment expenditures in Chinese firms. J. Law Econ. 54, 55–78.
Caselli, F., Gennaioli, N., 2005. Credit constraints, competition, and meritocracy. J. Eur. Econ. Assoc. 679–689.
Chang, C., Chen, X., Liao, G., 2014. What are the reliably important determinants of capital structure in china? Pacific-Basin Finance J. 30, 87–113.
Chen, H.J., Chen, S.J., 2012. Investment-cash flow sensitivity cannot be a good measure of financial constraints: evidence from the time series. J. Financial Econ. 103 (2), 393–410.
Chen, M., Guariglia, A., 2013. Internal financial constraints and firm productivity in China: do liquidity and export behavior make a difference? J. Comp. Econ. 41 (4), 1123–1140.
Chen, J.J., 2004. Determinants of capital structure of Chinese-listed companies. J. Bus. Res. 57 (12), 1341–1351.
Chow, C.K.W., Fung, M.K.Y., 1998. Ownership structure, lending bias, and liquidity constraints: evidence from shanghai's manufacturing sector. J. Comp. Econ. 26 (2), 301–316.
Chow, C.K., Fung, M.K.Y., 2000. Small businesses and liquidity constraints in financing business investment: evidence from shanghai's manufacturing sector. J. Bus. Venturing 15 (4), 363–383.
Chui, A.C., Lloyd, A.E., Kwok, C.C., 2002. The determination of capital structure: is national culture a missing piece to the puzzle? J. Int. Bus. Stud. 33 (1), 99–127.
Comin, D., 2006. Total Factor Productivity. An Eponymous Dictionary of Economics. Elgar Publishers, Ltd.
Coricelli, F., Driffield, N., Pal, S., Roland, I., 2012. When does leverage hurt productivity growth? A firm-level analysis. J. Int. Money Finance 31 (6), 1674–1694.
Cull, R., Xu, L., 2005. Institutions, ownership, and finance: the determinants of profit reinvestment among Chinese firms. J. Financial Econ. 77 (1), 117–146.
Cull, R., Xu, L.C., Zhu, T., 2009. Formal finance and trade credit during China's transition. J. Financial Intermediation 18 (2), 173–192.
Cull, R., Li, W., Sun, B., Xu, L.C., 2015. Government connections and financial constraints: evidence from a large representative sample of Chinese firms. J. Corporate Finance 32 (0), 271–294.
De Witte, K., Saal, D.S., 2010. Is a little sunshine all we need? On the impact of sunshine regulation on profits, productivity and prices in the Dutch drinking water sector. J. Regul. Econ. 37 (3), 219–242.
Delcoure, N., 2007. The determinants of capital structure in transitional economies. Int. Review of Econ. Finance 16 (3), 400–415.
Dewenter, K.L., Malatesta, P.H., 2001. State-Owned and privately owned firms: an empirical analysis of profitability, leverage, and labor intensity. Am. Econ. Rev. 91 (1), 320–334.
Dinç, I.S., 2005. Politicians and banks: political influences on government-owned banks in emerging markets. J. Financial Econ. 77 (2), 453–479.
Ding, S., Guariglia, A., Knight, J., 2013. Investment and financing constraints in China: does working capital management make a difference? J. Banking Finance 37 (5), 1490–1507.
Ding, S., Jia, C., Wu, Z., Zhang, X., 2014. Executive political connections and firm performance: comparative evidence from privately-controlled and state-owned enterprises. Int. Rev. Financial Anal. 36, 153–167.
Dreher, Axel, Kotsogiannis, Christos, McCorriston, Steve, 2007. Corruption around the world: evidence from a structural model. J. Comp. Econ. 35 (3), 443–466.
Driffield, N.L., Mickiewicz, T., & Temouri, Y., 2013. Institutional reforms, productivity and profitability: from rents to competition? J. Comp. Econ. 41 (2), 583–600.
Fama, E.F., French, K.R., 2002. Testing trade-off and pecking order predictions about dividends and debt. Rev. Financial Stud. 15 (1), 1–33.
Fazzari, S.M., Hubbard, R.G., Petersen, B.C., 1988. Financing constraints and corporate investment. Brooking Papers Econ. Act. 1, 141–195.

Fan, G., Wang, X., Ma, G., 2011. Contribution of marketization to China's economic growth. Econ. Res. J. 9, 4–16.
Fan, H., Lai, E.L.C., Li, Y.A., 2015. Credit constraints, quality, and export prices: Theory and evidence from China. J. Comp. Econ. 43 (2), 390–416.
Fazzari, S.M., Hubbard, R.G., Petersen, B.C., 2000. Investment-Cash flow sensitivities are useful: a comment on kaplan and zingales. Q. J. Econ. 115 (2), 695–705.
Firth, M., Lin, C., Liu, P., Wong, S.M.L., 2009. Inside the black box: bank credit allocation in China's private sector. J. Banking Finance 33 (6), 1144–1155.
Flannery, M.J., Rangan, K.P., 2006. Partial adjustment toward target capital structures. J. Financial Econ. 79 (3), 469–506.
Francis, J.R., Khurana, I.K., Pereira, R., 2005. Disclosure incentives and effects on cost of capital around the world. Accounting Rev. 80 (4), 1125–1162.
Frank, M.Z., Goyal, V.K., 2003. Testing the pecking order theory of capital structure. J. Financial Econ. 67 (2), 217–248.
Frank, M.Z., Goyal, V.K., 2009. Capital structure decisions: which factors are reliably important? Financial Manage. 38 (1), 1–37.
Girma, Sourafel, Thompson, Steve, Wright, Peter, 2006. International acquisitions, domestic competition and firm performance. Int. J. Econ. Bus. 13, 335–349.
Gray, P., Koh, P.S., Tong, Y.H., 2009. Accruals quality, information risk and cost of capital: evidence from Australia. J. Bus. Finance Accounting 36 (1-2), 51–72.
Grifell-Tatjé, E., Lovell, C.K., 1999. Profits and productivity. Manage. Sci. 45 (9), 1177–1193.
Guadalupe, M., Kuzmina, O., Thomas, C., 2012. Innovation and foreign ownership. Am. Econ. Rev. 102 (7), 3594–3627.
Guariglia, A., Liu, P., 2014. To what extent do financing constraints affect Chinese firms' innovation activities? Int. Rev. Financial Anal. 36, 223–240.
Guariglia, A., Liu, X., Song, L., 2011. Internal finance and growth: microeconometric evidence on Chinese firms. J. Dev. Econ. 96 (1), 79–94.
Héricourt, J., Poncet, S., 2009. FDI and credit constraints: firm-level evidence from China. Econ. Syst. 33 (1), 1–21.
Hadlock, C.J., Pierce, J.R., 2010. New evidence on measuring financial constraints: moving beyond the KZ index. Rev. Financial Stud. 23 (5), 1909–1940.
Hall, R.E., Jones, C.I., 1999. Why do some countries produce so much more output per worker than others? Q. J. Econ. 114, 83–116.
Harris, M., Raviv, A., 1991. The theory of capital structure. J. Finance 46 (1), 297–355.
Helwege, J., Liang, N., 1996. Is there a pecking order? Evidence from a panel of IPO firms. J. Financial Econ. 40 (3), 429–458.
Henry, Michael, Kneller, Richard, Milner, Chris, 2009. Trade, technology transfer and national efficiency in developing countries. Eur. Econ. Rev. 53 (2), 237–254 (Elsevier).
Hsieh, C.T., Klenow, P.J., 2010. Development accounting. Am. Econ. J.: Macroeconomics 2 (1), 207–223.
Huang, G., Song, F.M., 2006. The determinants of capital structure: evidence from China. China Econ. Rev. 17 (1), 14–36.
Huang, Z., Zhang, X., Zhu, Y., 2008. The role of clustering in rural industrialization: a case study of the footwear industry in Wenzhou. China Econ. Rev. 19 (3), 409–420.
Jefferson, G.H., Rawski, T.G., Zhang, Y., 2008. Productivity growth and convergence across china's industrial economy. J. Chin. Econ. Bus. Stud. 6 (2), 121–140.
Jensen, Michael C., Mecklin, William H., 1976. Theory of the firm: managerial behavior, agency costs, and ownership structure. J. Financial Econ. 3, 305–360.
Jensen, Michael C., 1986. Agency costs of free cash flow, corporate financing, and takeovers. Am. Econ. Rev. 76, 323–329.
Ju, J., Yu, X., 2015. Productivity, profitability, production and export structures along the value chain in China. J. Comp. Econ. 43 (1), 33–54.
Köke, J., Renneboog, L., 2005. Do corporate control and product market competition lead to stronger productivity growth? evidence from market-Oriented and blockholder-Based governance regimes. J. Law Econ. 48 (2), 475–516.
Kaplan, S.N., Zingales, L., 1997. Do investment-cash flow sensitivities provide useful measures of financing constraints. Q. J. Econ. 169–215.
Kaplan, R.S., 1986. The role for empirical research in management accounting Accounting. Organizations Soc. 11 (4), 429–452.
Khwaja, A.I., Mian, A., 2005. Unchecked intermediaries: price manipulation in an emerging stock market. J. Financial Econ. 78 (1), 203–241.
Kim, J.B., Simunic, D.A., Stein, M.T., Yi, C.H., 2011. Voluntary audits and the cost of debt capital for privately held firms: korean evidence. Contemp. Account. Res. 28, 585–615.
Klenow, P., Rodriguez-Clare, A., 1997. The neo-Classical revival In growth economics: has it gone too far? NBER Macroeconomics Ann. 12, 73–103.
Korajczyk, R.A., Levy, A., 2003. Capital structure choice: macroeconomic conditions and financial constraints. J. Financial Econ. 68 (1), 75–109.
Kraus, Alan, Litzenberger, R., 1973. A state-preference model of optimal financial leverage. J. Finance 28, 911–922.
Lai, K.-W., 2011. The cost of debt when all-equity firms raise finance: the role of investment opportunities, audit quality and debt maturity. J. Banking Finance 35 (8), 1931–1940.
Lamont, O., Polk, C., Saa-Requejo, J., 2001. Financial constraints and stock returns. Rev. Financial Stud. 14 (2), 529–554.
Lardy, N.R., 1998. China's Unfinished Economic Revolution. Brookings Institution Press.
Levinger, H., 2014. What's behind recent trends in Asian corporate bondmarkets? Deutsche Bank Research. Deutsche Bank.
Li, H., Meng, L., Wang, Q., Zhou, L.-A., 2008. Political connections, financing and firm performance: evidence from Chinese private firms. J. Dev. Econ. 87 (2), 283–299.
Li, K., Yue, H., Zhao, L., 2009. Ownership, institutions, and capital structure: evidence from China. J. Comp. Econ. 37 (3), 471–490.
Lu, S.F., Dranove, D., 2013. Profiting from gaizhi: management buyouts during China's privatization. J. Comp. Econ. 41 (2), 634–650.
Lu, Z., Zhu, J., Zhang, W., 2012. Bank discrimination, holding bank ownership, and economic consequences: evidence from China. J. Banking Finance 36 (2), 341–354.
Maksimovic, V., Gordon, P., 2002. Do conglomerate firms allocate resources inefficiently across industries? Theory and Evidence. J. Finance 57 (2), 721–767.
Margaritis, D., Psillaki, M., 2010. Capital structure, equity ownership and firm performance. J. Banking Finance 34 (3), 621–632.
McGuckin, R.H., Nguyen, S.V., 1995. On productivity and plant ownership change: new evidence from the longitudinal research database. RAND J. Econ. 257–276.
Modigliani, F., Miller, M.H., 1958. The cost of capital, corporate finance and the theory of investment. Am. Econ. Rev. 48, 261–297.
Myers, S.C., Majluf, N.S., 1984. Corporate financing and investment decisions when firms have information that investors do not have. J. Financial Econ. 13 (2), 187–221.
Myers, S.C., 1977. Determinants of corporate borrowing. J. Financial Econ. 5 (2), 147–175.
Myers, S.C., 1984. The capital structure puzzle. J. Finance 39 (3), 574–592.
Olley, G. Steven, Pakes, Ariel, 1996. The dynamics of productivity in the telecommunications equipment industry. Econometrica 64, 6.
Ovtchinnikov, A.V., 2010. Capital structure decisions: evidence from deregulated industries. J. Financial Econ. 95 (2), 249–274.
Ozkan, A., 2001. Determinants of capital structure and adjustment to long run target: evidence from UK company panel data. J. Bus. Finance Accounting 28 (1–2), 175–198.
Poncet, S., Steingress, W., Vandenbussche, H., 2010. Financial constraints in China: firm-level evidence. China Econ. Rev. 21 (3), 411–422.
Qian, Y., Stiglitz, J., 1996. Institutional innovations and the role of local government in transition economies: the case of Guangdong province of China. In: John McMillan, Barry Naughton (Eds.), Reforming Asian Socialism: The Growth of Market Institutions. University of Michigan Press.
Qian, Y., Xu, C., 1993. Why China's economic reforms differ: the M-form hierarchy and entry/expansion of the non-state sector. Econ. Transition 1, 135–170.
Qian, Y., Tian, Y., Wirjanto, T.S., 2009. Do Chinese publicly listed companies adjust their capital structure toward a target level? China Econ. Rev. 20 (4), 662–676.
Qian, Y., 1996. Enterprise reform in China: agency problems and political control. Econ. Transition 4, 427–447.
Rajan, R.G., Zingales, L., 1995. What do we know about capital structure? Some evidence from international data. J. Finance 50 (5), 1421–1460.
Roodman, D., 2009. How to do xtabond2: An introduction to difference and systemgmm in stata. Stata J. 9 (1), 86–136.
Ross, S., 1977. The determination of financial structure: the incentive signaling approach. Bell J. Econ. 8 (1), 23–40.
Sánchez-Ballesta, J.P., García-Meca, E., 2007. Ownership structure, discretionary accruals and the informativeness of earnings. Corporate Governanc 15 (4), 677–691.
Saal, D.S., Parker, D., 2001. Productivity and price performance in the privatized water and sewerage companies of England and Wales. J. Regul. Econ. 20 (1), 61–90.
Sapienza, P., 2004. The effects of government ownership on bank lending. J. Financial Econ. 72 (2), 357–384.
Schoar, A., 2002. Effects of corporate diversification on productivity. J. Finance 57 (6), 2379–2403.
Shailer, G., Wang, K., 2015. Government ownership and the cost of debt for Chinese listed corporations. Emerging Markets Rev. 22, 1–17.
Shleifer, A., Vishny, R., 1994. Politicians and firms. Q. J. Econ. 109, 995–1025.
Shyam-Sunder, L., Myers, S.C., 1999. Testing static tradeoff against pecking order models of capital structure. J. Financial Econ. 51 (2), 219–244.
Silva, A., 2011. Financial constraints and exports: evidence from Portuguese manufacturing firms. Int. J. Econ. Sci. Appl. Res. 3, 7–19.
Solow, R.M., 1957. Technical change and the aggregate production function. Rev. Econ. Stat. 312–320.
Sun, Q., Tong, W.H., 2003. China share issue privatization: the extent of its success. J. Financial Econ. 70 (2), 183–222.

Tian, G.L., 2001. State shareholding and the value of China's firms. Working Paper. London Business School, London, UK.
Titman, S., Wessles, R., 1988. The determinants of capital structure choice. J. Finance 43 (1), 1–19.
Tsai, H.-F., Lin, T.-J., Hung, J.-H., 2014. The effects of the split share structure reform on Chinese listed firms' leverage decisions. The Quarterly Review of Economics and Finance.
Wang, Y., You, J., 2012. Corruption and firm growth: evidence from China. China Econ. Rev. 23 (2), 415–433.
Wang, Q., Wong, T.J., Xia, L., 2008. State ownership, the institutional environment, and auditor choice: evidence from China. J. Accounting Econ. 46 (1), 112–134.
Warner, J.B., 1977. Bankruptcy costs: some evidence. J. Finance 32 (2), 337–347.
Whited, T.M., Wu, G., 2006. Financial constraints risk. R. Financial Stud. 19 (2), 531–559.
Wiwattanakantang, Y., 1999. An empirical study on the determinants of the capital structure of Thai firms. Pacific-Basin Finance J. 7 (3), 371–403.
Wu, W., Wu, C., Zhou, C., Wu, J., 2012. Political connections, tax benefits and firm performance: evidence from China. J. Accounting Public Policy 31 (3), 277–300.
Xu, X., Wang, Y., 1999. Ownership structure and corporate governance in Chinese stock companies. China Econ. Rev. 10 (1), 75–98.
Zou, H., Adams, M.B., 2008. Debt capacity, cost of debt, and corporate insurance. J. Financial Quant. Anal. 43 (02), 433–466.
Zou, H., Xiao, J.Z., 2006. The financing behaviour of listed Chinese firms. Br. Accounting Rev. 38 (3), 239–258.
Zou, H., Adams, M.B., Buckle, M.J., 2003. Corporate risks and property insurance: evidence from the People's Republic of China. J. Risk Insur. 70 (2), 289–314.