



## LEVERAGE, DEBT MATURITY AND CORPORATE PERFORMANCE: EVIDENCE FROM CHINESE LISTED COMPANIES



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### ABSTRACT

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This paper examines the relationship between leverage, debt maturity and firm performance, employing a large panel of Chinese non-financial listed firms. The corporate finance literature widely recognizes that the debt and maturity structures are important mechanisms for addressing agency problems in modern corporations. We applied the system GMM estimator to control for endogeneity concerns in the study. We found positive associations between leverage and the proportion of long term debt, and between leverage and firm performance. Our results indicate that leverage and its maturity structure are important determinants of the profitability of Chinese listed firms. Our research has significant policy implications as it suggests that, since China's financial system is dominated by a large banking system, lenders (mainly banks) may extend more long term credit to the more productive private sector, which helps to improve performance of these firms. The findings of this study imply that the Chinese government's efforts to improve the governance of its banking system have been successful in enhancing efficiency and prudence in banks' lending and monitoring behavior.

**Contribution/ Originality:** This study contributes to the finance literature by examining for the first time the performance effects of both leverage and its maturity structure in the context of China. The study shows that leverage and its maturity are important determinants of the performance of Chinese listed firms. The study contributes to the literature on debt financing and bank monitoring in transition economies.

## 1. INTRODUCTION

In the corporate finance literature, it is widely recognized that the leverage and maturity structure are important mechanisms for addressing agency problems in modern corporations. Modigliani and Miller (1958) argue that under perfect capital market conditions, capital structure is irrelevant to the value of the firm. However, in reality, the existence of a variety of market imperfections (such as taxes, agency problems and asymmetric information) make capital structure choices relevant to the firm value (Modigliani and Miller, 1963; Jensen and Meckling, 1976; Myers, 1977; Myers and Majluf, 1984)<sup>1</sup>. For example, while Modigliani and Miller (1963) show

<sup>1</sup>See Shleifer and Vishny (1997) for a survey.

that corporate taxes affect the cost of capital and thus the firm value, Jensen and Meckling (1976) argue that even in the absence of taxes, debt capital through its governance role can affect corporate performance.

Agency conflicts between management and shareholders as well as between shareholders and debtholders generate substantial agency costs for the firms and the economy as a whole (Alchian and Demsetz, 1972; Jensen and Meckling, 1976). According to Jensen and Meckling (1976) the agency costs of equity arise from the conflicts of interest between management and shareholders when the ownership and control of the firm are separated. In these circumstances, self-serving managers indulge in the overconsumption of salaries and perks, and tend to expand the firm to increase their compensation and reputations (i.e. empire building) at the expense of shareholders, rather than making value maximizing decisions.

Yet, agency theory also suggests that the leverage can serve as a crucial mechanism to mitigate these agency costs of equity (Jensen and Meckling, 1976; Fama and Jensen, 1983; Jensen, 1986; Stulz, 1990; Jensen, 1993). For instance, Jensen (1986) suggests that debt is a valuable monitoring device for firms with large cash flows and few growth opportunities since it commits managers to disgorging a fixed interest payment to the debt holders, thereby reducing the free cash flow problem (i.e. empire-building investments). Therefore, a high debt ratio decreases the agency costs of equity financing and thus increases a firm's profitability by encouraging managers to align their interests with the shareholders' interests.

Advancing capital structure research, theoretical and empirical studies analyse the impact of debt maturity structure on investment and financial decisions, as well as on firm performance. Some research suggests that in certain circumstances, short maturity debt serves as an effective governance mechanism to mitigate any agency costs of debt and equity. For example, Myers (1977) shows that short-term debt alleviates conflicts between bondholders and shareholders and thus reduces underinvestment problems. Others including Schiantarelli and Jaramillo (1996) show that in fact long-term debt helps improve firms' productivity as it may allow firms access to better and more productive technologies, which the firm may be reluctant to finance with short-maturity debt due to the high level of liquidity risk.

Unlike a large number of prior studies that have examined the determinants of capital structure decisions (e.g., Titman and Wessels, 1988; Rajan and Zingales, 1995; Wald, 1999; Booth *et al.*, 2001; Frank and Goyal, 2009; Vijayakumaran and Vijayakumaran, 2011;2018) only a limited number of studies analyze the effects of leverage and debt maturity on firms' performance (See McConnell and Servaes, 1995; Schiantarelli and Srivastava, 1996; Dessí and Robertson, 2003; Baum *et al.*, 2007; Margaritis and Psillaki, 2010; Vijayakumaran, 2015). In the context of China, Tian and Estrin (2007); Firth *et al.* (2008) and Vijayakumaran (2019) have looked at the effect of debt financing on agency costs faced by the Chinese listed firms. The former two studies unanimously find evidence that the Chinese government's ownership of both banks and firms, and the resultant soft budget constraints make debt an ineffective governance mechanism in reducing agency costs for Chinese listed firms, and particularly SOEs. However, the latter study provides evidence consistent with the notion that as a result of a series of reforms of the banking system and the governance of the listed companies<sup>2</sup>, debt financing works as an effective mechanism to reduce agency costs for Chinese listed firms. Yet, to the best of our knowledge, no one has focused on examining the effects of both debt and maturity structure on the firm performance of Chinese listed companies for the post World Trade Organization (WTO) accession period<sup>3</sup>. This paper fills this gap in the literature.

Thus, this study examines the performance effects of both debt and maturity structure using a large sample of Chinese non-financial listed companies for the period 2003 to 2010. Applying the system GMM estimator to account for unobserved heterogeneity, and the possible endogeneity of regressors, the study documents a clear

<sup>2</sup> For instance, these reforms involved the introduction of foreign ownership and management in state owned commercial banks and the listing of these banks in stock exchanges. See Vijayakumaran and Vijayakumaran (2017); Vijayakumaran (2016) for a detailed discussion of China's banking sector reforms and ownership reforms.

<sup>3</sup> Although Vijayakumaran (2017) uses a subsample of Chinese listed firms, namely manufacturing firms to investigate the impact of leverage on corporate profitability, his paper does not analyse performance effect of debt maturity.

evidence of positive associations between leverage and the proportion of long term debt, and between leverage and firm profitability. These results indicate that the Chinese government's efforts to improve the governance of its banking system have been successful in enhancing efficiency and prudence in Chinese banks' lending and monitoring behavior. Thus, debt financing (mostly bank debt) works as a governance mechanism to constrain agency conflicts and improve firm performance.

This study makes several contributions to the existing literature. First, we provide the first evidence on the effects of leverage and its maturity on financial performance for a large sample of listed companies in China, the largest emerging economy in the world. Although one paper examines the determinants of debt maturity for Chinese listed firms (Cai *et al.*, 2008) no evidence is available on the impact of debt maturity on firm performance. By analyzing this issue, we add to the very limited but growing literature on the performance effects of leverage and its maturity from an emerging market perspective.

Second, for the first time, we analyse the impact of leverage and its maturity on corporate performance, differentiating between state-controlled and private controlled firms. This distinction is particularly relevant in the Chinese context where the government still has considerable ownership and control over the listed firms.

The rest of the article is laid out as follows. Section two reviews prior literature that focuses on the link between leverage and firm performance, as well as debt maturity and firm performance and develops hypotheses. Section three discusses the model specifications and estimation methodology. In section four, we describe the data and summary statistics. The results of the study are presented in section five. And finally, section six concludes the paper.

## 2. LITERATURE REVIEW AND HYPOTHESES

In this section, we develop our hypotheses by discussing how leverage and its maturity structure are likely to affect firm performance.

### 2.1. Leverage and Firm Performance

The agency theory suggests that the separation of ownership and control of the firm leads to conflict of interests between management and shareholders (Berle and Means, 1932; Jensen and Meckling, 1976). For instance, executives may exert insufficient effort, consume excessive perquisites, and invest in unprofitable businesses to build empires, failing to maximize shareholders' wealth. The theory also suggests that leverage can help to alleviate the agency costs of outside equity. Debt financing works as a control mechanism through the following channels: (1) managers are closely monitored by debt-holders and more generally by the financial market (Jensen and Meckling, 1976; Fama and Jensen, 1983) (2) the fixed interest payments that need to be made to the debt holders reduce the excess free cash flow which managers tend to use for their discretionary spending (Jensen, 1986) and (3) according to Zwiebel (1996) debt serves as a commitment device for executives. Since the interest payment to debt holders is a legal obligation, the failure to meet this obligation is a potential risk of bankruptcy which may affect managers' reputations and future job opportunities (Fama, 1980; Grossman and Hart, 1982; Williams, 1987).

This provides managers with an incentive to work hard and consume fewer perks (Grossman and Hart, 1982; Zwiebel, 1996). For example, Aghion and Bolton (1992) and Gilson (1990) show that financial distress or continuous low profits may lead to a shift of control of the firm to debt holders, which often results in the replacement of incumbent managers. In sum, these arguments suggest that a high debt ratio decreases the agency costs of equity financing by aligning managers' interests with that of the shareholders and thus, it will have a positive impact on firm performance.

Nonetheless, using debt financing to deal with the agency costs of equity is not costless. The use of debt capital in the firm itself leads to conflicts of interest between shareholders and debtholders which create agency costs of

debt.<sup>4</sup> That is, when leverage is relatively high, managers who work on behalf of their stockholders might forgo positive net present value projects because risky debt absorbs a portion of stockholders' benefits. Myers (1977) thus argues that there is a potential for an 'under-investment' problem arising from the use of higher levels of leverage. Greater financial leverage also increases the agency costs through the threat of default risk, liquidation, and bankruptcy. These moral hazard problems suggest that leverage may negatively affect firm performance.

Empirical findings on the relationship between leverage and performance are mixed. Some researchers (Dessi and Robertson, 2003) show that debt is endogenously determined in light of both observed and unobserved firm characteristics in ways consistent with value maximization. Others (e.g. Majumdar and Chhibber (1999)) find the relationship to be negative. By contrast, Berger and Udell (2006) find that leverage is positively related to firm performance even after controlling for endogeneity. Weill (2008) finds that the association between leverage and firm performance varies across countries, i.e. while the relationship between the two is positive in five countries, namely Belgium, France, Germany, Norway and Spain, it is negative in Italy and not significant in Portugal, suggesting that institutional factors affect this link. Sarkar and Sarkar (2008) show that debt financing has become an effective governance mechanism for Indian firms with improvement in the institutional environment which has become market oriented.

In the Chinese context, early empirical studies show that since both banks and firms are owned and controlled by the Chinese government, leverage was an ineffective device to mitigate agency conflicts, especially for SOEs (Tian and Estrin, 2007; Firth *et al.*, 2008). This is because lenders (often government owned banks) have no incentive to monitor managers or controlling shareholders behaviour, since the government would not allow both of these institutions failing. However, the recent research shows that as a result of a series of reforms in the banking system and governance of the listed companies, debt financing works as an effective mechanism to reduce agency costs for Chinese listed firms (Cull and Xu, 2005; Ayyagari *et al.*, 2008; Firth *et al.*, 2009; Vijayakumaran, 2017;2019). We would, therefore, expect to observe a positive association between leverage and profitability of the firms. Yet, to the best of our knowledge, no one has focused on examining the effects of debt on the firm performance of Chinese listed companies for the post WTO accession period. Based on the above reasoning, our hypothesis is that:

H<sub>1</sub>: There is a significant positive relationship between leverage and firm performance.

## 2.2. Debt Maturity Structure and Firm Performance

Corporate finance literature argues that the incentive properties of short-maturity debt make it a more effective controlling mechanism than long term debt in mitigating agency conflicts between management and shareholders. For instance, Myers (1977) shows that short-term debt alleviates conflicts between bondholders and shareholders over the exercise of growth options and thus underinvestment problems. Firms with greater growth options face greater underinvestment problems. Therefore, Myers (1977) notes that firms with more growth options are likely to employ shorter-maturity debt. Debt that matures before the execution of investment options cannot lead to suboptimal investment decisions. Given that underinvestment deteriorates profits in the long run, such behaviour implies a negative relationship between long term debt and firm performance. Further, Leland and Toft (1996) show that short-term debt can reduce the agency costs associated with the shareholders' risk-shifting behavior (asset substitution). Similarly, short-maturity debt is more effective than longer maturity debt in disciplining managers by imposing a refinancing pressure on them and transferring control rights from owners to creditors, (e.g., Diamond, 1991; Hart and Moore, 1994;1998; Rajan and Zingales, 1995; Stulz, 2000).

Research also highlights the problem associated with the short-term debt. For instance, Hart and Moore (1995) show that the short maturity debts provide managers with the flexibility to use assets in place to follow their goal

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<sup>4</sup> Two agency costs of debt are asset substitution Jensen and Meckling (1976) and underinvestment or debt overhang problem Myers (1977) See Vijayakumaran (2016) for a more detailed discussion on agency costs of debt.

of empire building. Therefore, only long-term debt is effective in limiting the ability of managers to build empires by financing new projects based on assets in place.

Looking at the empirical studies, Baum *et al.* (2007) report that the proportion of short-term debt positively affects the profitability of German firms (a bank-based economy) though this relationship is not observed for US firms. Abor (2005) also reports a positive relation between short-term debt and profitability. By contrast, Schiantarelli and Jaramillo (1996); Schiantarelli and Sembenelli (1997) and Schiantarelli and Srivastava (1996) provide empirical evidence that short maturity debt is not conducive to improving firm performance when measured by total factor productivity.

Previous research shows that for an average Chinese firm, about 86% of the total debt is due within one year, indicating that short-term debt is popular among Chinese firms (also see Table 2.) Huyghebaert and Wang (2016) point out that Chinese banks try to curb their bigger exposure to firm-specific risk, arising from a more market-oriented lending policy, by shortening debt maturity. This lending behavior of banks might negatively affect firm productivity and performance, since it is the long-term debt that may improve firms' productivity because it may allow firms access to better and more productive technologies, which the firm may be reluctant to finance with short-term debt due to the high level of liquidity risk as argued in Schiantarelli and Jaramillo (1996). Therefore, we would expect to observe an inverse relationship between the proportion of short-term debt and firm performance. We thus hypothesise that:

H<sub>2</sub>: There is a significant negative association between the proportion of short-maturity debt in total debt and firm performance (equally, there is a significant positive association between the proportion of long-maturity debt in total debt and firm performance).

### 3. MODEL SPECIFICATION AND ESTIMATION METHODOLOGY

#### 3.1. Model Specification

We estimated the following regression model Equation 1 to formally test the link between leverage, the proportion of short-term debt in total debt, and corporate performance.

$$\text{PERF}_{it} = \beta_0 + \beta_1 \text{PERF}_{i-1} + \beta_2 \text{PERF}_{i-2} + \beta_3 \text{TLEV}_{it} + \beta_4 \text{PROP\_STLEV}_{it} + \beta_5 \text{SIZE}_{it} + \beta_6 \text{TANG}_{it} + \beta_7 \text{SAGROWTH}_{it} + \beta_8 \text{INVENT}_{it} + \beta_9 \text{LIQ}_{it} + \beta_{10} \text{FAGE}_{it} + v_i + v_t + v_j + v_r + \varepsilon_{it} \quad (1)$$

where  $i$  indexes firms and  $t$ , years. The error term in Equation 1 is made up of five components.  $v_i$  is a firm-specific effect;  $v_t$ , a time-specific effect, which we control for by including time dummies capturing business cycle effects;  $v_j$ , an industry-specific effect, which we take into account by including industry dummies; and  $v_r$ , a region-specific effect, which we control for by including a full-set of regional dummies. Finally,  $\varepsilon_{it}$  is an idiosyncratic component. The definitions of the variables used in the paper are provided in Table A1. Following Baum *et al.* (2007) and Wintoki *et al.* (2012) to control for persistency in performance and dynamic endogeneity of leverage and debt maturity structure variables, we included two lags of our performance measures among our explanatory variables in Equation 1.<sup>5</sup> Following Schiantarelli and Sembenelli (1997) and Schiantarelli and Srivastava (1996), we included both leverage and the proportion of short-term liabilities to total debt in our model to see the effects of both leverage and its maturity on corporate performance.

#### 3.1.1. Performance Measures

To estimate the impact of the leverage and debt maturity structure on the performance of the Chinese listed firms, following Baum *et al.* (2007) and Wintoki *et al.* (2012) the return on assets ratio (*ROA*) was used as the main

<sup>5</sup> Glen, Lee and Singh (2001) and Gschwandtner (2005) analyse persistence in profitability and note that two lags are sufficient to purge persistence.

firm profitability measure. *ROA* was defined as operating income before interest, tax and depreciation divided by year-end total assets. In addition, return on sales (*ROS*) and productivity (*PROD*) were also used as alternative performance measures. As in Wintoki *et al.* (2012), the return on sales ratio (*ROS*) was measured by the ratio of operating income before interest, tax and depreciation to sales. Additionally, following Aivazian *et al.* (2005), we also used productivity (*PROD*), which was proxied by the ratio of real sales to total number of employees to measure efficiency of firms. These two attributes (profitability and productivity) are perhaps the most important indicators of Chinese firms' performance because enhancing the performance and efficiency of the state-owned enterprises through the corporate governance reforms such as corporatization, partial privatization and split-share structure reform were the main goals of the Chinese government.

Although economists prefer to use stock market based performance indicators (e.g. Tobin's *Q* or the market to book ratio of equity) to measure performance, we used two accounting-based performance measures (i.e. *ROA* and *ROS*) which are most commonly used in the literature, particularly in emerging markets (Zeitun and Gang, 2007). Using Tobin's *Q* as a measure of company performance to analyse the relationship between governance mechanisms such as debt financing and performance can be problematic in emerging markets such as China for two reasons (Demsetz and Villalonga, 2001; Conyon and He, 2012; Wintoki *et al.*, 2012). Firstly, Tobin's *Q* (i.e. the market value of equity and debt to the replacement value of assets), represents growth opportunities. Wintoki *et al.* (2012) argue that growth opportunities can be considered as a cause, rather than a consequence, of governance structures. Secondly, since the Chinese financial markets are characterised by the lack of information transparency and opaqueness, accounting-based firm performance measures are considered more informative to investors in assessing governance and performance relationship (Morck *et al.*, 2000; Conyon and He, 2012).

### 3.1.2. Leverage and Debt Maturity Variables

The main independent variables are total leverage (denoted by *TLEV*), and the proportion of short-term debt in total debt (denoted by *PROP\_STLEV*), which were used to capture the effects of capital structure decisions on corporate performance. Following Dessí and Robertson (2003) and Margaritis and Psillaki (2010), leverage was defined as the total debt to total assets ratio. As in Schiantarelli and Sembenelli (1997) and Baum *et al.* (2007), we used the proportion of short-term debt in total debt (short-term debt divided by total debt) as a proxy for debt maturity.

### 3.1.3. Control Variables

Following previous studies (e.g., Majumdar and Chhibber, 1999; Dessí and Robertson, 2003; Baum *et al.*, 2007; Margaritis and Psillaki, 2010), we also included several additional variables to control for a set of firm-specific characteristics that were likely to be correlated with firms' performance in our specifications (Equation 1).

#### Firm Size

Prior studies suggest that firm size is an important determinant of corporate performance and they found a positive relationship between firm size and performance, since larger firms are expected to have better technology, be more diversified and better managed than smaller firms. Large firms also performed better than smaller firms through economies of scale in monitoring top management and had a higher capacity for taking risks (Himmelberg *et al.*, 1999; Greenaway *et al.*, 2007; Dixon *et al.*, 2017). In line with these arguments, we also expected to observe a positive relationship between firm size (*SIZE*) and performance in our sample.

#### Tangibility

Tangible assets can be monitored easily and are often used as collateral for debt (Himmelberg *et al.*, 1999). Thus, they mitigate agency problems. However, diverse relationships can be observed between firms' performance

and tangibility depending on the degree of efficient utilization of tangible assets by the firm. If a firm utilizes its tangible assets efficiently, we would expect a positive relationship between tangibility and performance otherwise the relationship would be negative.

Most of the previous studies reported a positive relationship between tangibility and performance [see, for example, Margaritis and Psillaki (2010)]. In this line, we expected to observe a positive relationship between tangibility and firms' performance. Following the previous research (Margaritis and Psillaki, 2010) we measured the tangibility (*TANG*) as the ratio of fixed tangible assets to total assets.

#### *Sales Growth*

Majumdar and Chhibber (1999) suggested that sales growth could capture business-cycle effects and environmental volatility. Since sales growth represents a firm's growth prospects, they may be able to generate higher profit, suggesting that there should be a positive relationship between the sales growth and corporate performance. By contrast, such growth opportunities may attract new entrants, quite a common occurrence in emerging markets, which may reduce average profits for all firms. Previous empirical studies reported a positive effect of growth opportunities on firm performance (Dessí and Robertson, 2003; Margaritis and Psillaki, 2010). In line with these studies, we expected to observe a positive relationship between sales growth and a firm's performance. Following Majumdar and Chhibber (1999); Margaritis and Psillaki (2010) growth opportunities (*SALGROWTH*) were measured by the growth of sales.

#### *Inventories*

Inventories were used here to control for industry-related effects since some industries need greater stockholding, but also to help account for business-cycle effects since in downturns (upturns) inventories tend to be accumulated (decumulated) (Majumdar and Chhibber, 1999). Since the stocking of inventories means a greater need for working capital, higher interest costs and, therefore, an erosion of profitability, there should be a negative relationship between inventory and firms' performance. In line with this explanation, we expected to observe a negative relationship between inventories and firms' performance. Following Majumdar and Chhibber (1999), inventory (*INVENT*) was measured by the ratio of inventories to total assets.

#### *Liquidity*

Liquidity was used to control for industry-related and business-cycle factors. Cash requirements for a firm reflect industry practices as well as the overall economic climate, since in lean times, cash-flow crises can arise. Firm-specific attributes can also be captured by liquidity, since the management's ability to manage working capital and acquire a greater quantity of cash balances reflects superior skills which are also likely to be reflected in a firm's profitability. Therefore, there should be a positive relationship between corporate liquidity and performance. Previous empirical studies also reported a positive effect of liquidity on firm performance (see for example Majumdar and Chhibber (1999) and Baum *et al.* (2007)). Following Baum *et al.* (2007), liquidity (*LIQ*) was measured by the ratio of cash and cash equivalent to total assets.

### *Firm Age*

Firm age was expected to have a negative relation with firm performance, given that older firms are more likely to be state controlled firms and thus suffer more agency problems. Firm age (FAGE) was measured by the natural logarithm of the number of years since the establishment of the firm.

## *3.2. Estimation Methodology*

### *3.2.1. Endogeneity*

Endogeneity was an important concern in our study. First, our estimates could have been affected by reverse causality (i.e. not only a firm's capital structure affect its performance, but a firm's performance may also affect the capital structure). For example, according to Jensen (1986) free cash flow hypothesis, debt may act as a valuable managerial incentive mechanism, because it commits managers to pay fixed interest payment to the debt holders, thereby reducing the free cash flow available to the managers' discretionary spending. Thus, debt tends to increase firm's performance. But more efficient firms are more likely to choose relatively higher levels of debt since the higher expected returns from the greater efficiency reduces the expected costs of bankruptcy and financial distress.

A second source of endogeneity was that unobservable characteristics of the firm (firm-specific fixed effects) [for example, managers' ability and entrenchment (Zwiebel, 1996)] were likely to affect both its capital structure choices and its expected performance:<sup>6</sup>

Therefore, in order to address for the potential endogeneity issues, following Baum *et al.* (2007) we used the system Generalized Methods of Moments (GMM) estimator (Arellano and Bover, 1995; Blundell and Bond, 1998). The system GMM estimator addresses the potential weak instrument problem. We used all right-hand side variables (except firm age and the dummy variables) lagged twice or more as instruments in the first-differenced equation, and first-differences of these same variables lagged once as instruments in the level equation. We used the Sargan/Hansen test for over identifying restrictions, and the test for second order autocorrelation of the differenced residuals (AR (2)) to test the validity of our instruments. In the case of failure of the Sargan/Hanson test and/or AR (2) test, regressors lagged three times or more were included in the instrument set (Bond, 2002).

## **4. DATA AND DESCRIPTIVE STATISTICS**

In this section, we describe the dataset and sample that is used in our study and provide a discussion on summary statistics and correlation analysis of our variables.

### *4.1. Data and Sample Selection*

The data used in this study were obtained from two Chinese databases, namely, the China Stock Market Accounting Database (CSMAR) and Sino-fin for the period of 2003-2010. The sample was composed of publicly listed non-financial firms traded on the Shanghai and Shenzhen stock exchanges. Following the literature, we excluded financial firms from our analysis. To reduce the influence of potential outliers, we excluded observations in the one percent tails of each of the regression variables. Since we used two lags of the dependent variable in our empirical model, we ended up with a panel of 6271 firm-year observations on 1420 companies over the period 2005-2010. The panel had an unbalanced structure.

### *4.2. Summary Statistics*

Table 1 presents descriptive statistics for the variables used in the analysis for the pooled full sample of firms. The pooled mean (median) return on assets (*ROA*) and return on sales (*ROS*) were 7.3% (7.2%) and 7.8% (7.4%), respectively. The pooled mean (median) productivity (*PROD*), measured as real sales per employee, was 0.50 million RMB (0.25).

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<sup>6</sup> These are stable over time but will change across firms.

Table-1. Summary statistics.

Variables	Obs.	Mean	Median	Std. Dev.	Min	Max
Return on assets ( <i>ROA</i> )	6271	0.073	0.072	0.066	-0.386	0.272
Return on sales ( <i>ROS</i> )	6271	0.078	0.074	0.177	-4.028	1.717
Productivity ( <i>PROD</i> ) (million RMB)	5631	0.508	0.253	0.862	0.022	9.308
Leverage ratio ( <i>TLEV</i> )	6271	0.517	0.525	0.188	0.059	1.479
Short-term debt ( <i>PROP_STLEV</i> )	6271	0.866	0.926	0.151	0.362	1.000
Long-term debt ( <i>PROP_LTLEV</i> )	6271	0.134	0.074	0.151	0.000	0.638
Total assets ( <i>SIZE</i> ) (billion RMB)	6271	1.706	0.826	2.800	0.075	26.136
Tangibility ( <i>TANG</i> )	6271	0.295	0.272	0.167	0.004	0.760
Sales growth ( <i>SALGRTH</i> )	6271	0.131	0.091	0.342	-0.653	3.459
Inventory ( <i>INTVENT</i> )	6271	0.439	0.373	0.317	0.001	1.719
Liquidity ( <i>LIQ</i> )	6271	0.158	0.133	0.105	0.007	0.660
Firm age ( <i>FAGE</i> )	6271	11.736	12.000	3.865	3.000	26.000

Note: Definitions of all the variables used in this paper are provided in Table A1.

The average (median) leverage to total assets ratio (*TLEV*) was 51.7 (52.5) per-cent, suggesting that about 50% of the firms' assets are financed by debt capital. We observed that the average (median) proportion of short-term debt to total debt (*PROP\_STLVE*) is 86.6 % (92.6%). The minimum and maximum values of the short-term debt (*PROP\_STLEV*) ratios ranged from 36.0 % to 100 % with a standard deviation of 15.1%.

With respect to the control variables included in our baseline model, the average (median) size of the firms measured by real total assets was about 1.706 billion RMB (0.826 billion RMB)<sup>7</sup>. The average (mean) tangible assets ratio, measured by the ratio of fixed assets to total assets is 0.29 (0.27). The pooled mean (median) value of sales growth, measured by the real annual sales growth rate, is 13 % (9%). While the average (median) inventory ratio is 44% (37%), the pooled mean (median) value of liquidity, measured as firm's cash and cash equivalent scaled by its total assets, is 16% (13%). Finally, the average (median) firm age measured by number of years from the establishment of firm is 11.73 (12)

#### 4.3. Correlation Analysis

Table 2 reports the Pearson correlation coefficients between variables. Total leverage (*TLEV*) showed a negative correlation with firms' performance measured by *ROA* and *ROS*, while it showed a positive and statistically significant correlation with firms' performance measured by *PROD*. The proportion of long-term debt (*PROP\_LTLEV*) exhibited a significant positive correlation with *ROA* and *ROS*, while the proportion of short-term debt (*PROP\_STLEV*) exhibited a significant negative correlation with *ROA* and *ROS*, as we hypothesized (H2).

Turning to control variables, as expected, firm size, sales growth and liquidity had a significant and positive correlation with *ROA*, *ROS* and *PROD*. While tangibility had a significant positive correlation with *ROA*, it was negatively associated with *ROS* and *PROD*. Finally, it was interesting to note that inventory and firm age had a negative but statistically insignificant correlation with *ROS*, while they showed a significant negative correlation with *ROA*.

Finally, Table 2 suggests that since the observed correlation coefficients were relatively low, multicollinearity was not be a serious problem in our study

<sup>7</sup> It should be noted that although firm size is measured as the logarithm of total real assets in the regression analysis, the figures reported in Table 2-the descriptive statistics are not in logarithms but as actual values. Real variables are derived from nominal ones using China's GDP deflator.

Table-2. Pearson correlation matrix.

No.	Variables	1	2	3	4	5	6	7	8	9	10	11	12
1	ROA	1.00											
2	ROS	0.63*	1.00										
3	PROD	0.00	0.01	1.00									
4	TLEV	-0.33*	-0.26*	0.14*	1.00								
5	PROP_STLEV	-0.06*	-0.13*	0.01	-0.13*	1.00							
6	PROP_LTLEV	0.06*	0.13*	-0.01	0.13*	-1.00*	1.00						
7	TANG	0.13*	-0.04*	-0.22*	0.03*	-0.25*	0.25*	1.00					
8	SALGRTH	0.26*	0.18*	0.09*	0.05*	-0.04*	0.04*	-0.04*	1.00				
9	INVENT	-0.08*	-0.00	0.18*	0.18*	0.12*	-0.12*	-0.44*	0.10*	1.00			
10	LIQ	0.14*	0.11*	0.07*	-0.28*	0.20*	-0.20*	-0.38*	0.04*	-0.08*	1.00		
11	SIZE	0.09*	0.08*	0.15*	0.18*	-0.29*	0.29*	0.06*	0.09*	0.04*	-0.03*	1.00	
12	FAGE	-0.08*	-0.02	0.06*	0.15*	-0.06*	0.05*	-0.06*	-0.05*	0.05*	-0.05*	0.07*	1.00

Notes: \* denotes significance at the 5% level and more. See Table A1 in the Appendix for definitions of all variables.

## 5. EMPIRICAL RESULTS

The estimation results of Equation 1 are shown in Table 3 when the firm's performance is measured by ROA. While Column (1) displays the results for all firms, Columns (2)-(3) report the results for sub-sample of firms, namely, non-state controlled firms and state controlled firms, respectively.

As can be seen in column (1), when endogeneity is controlled for using the system GMM estimator, the estimated impact of leverage (*TLEV*) on firm's performance is positive and statistically significant, in line with our hypothesis H1. This finding is consistent with the agency theory, which suggests that debt financing is an effective mechanism to control agency costs by bringing in external monitoring and curbing discretionary spending (i.e. interest payment being an obligatory payment to the debt holders reduces the free cash flow available to the managers' discretionary spending) (Jensen, 1986) and thereby improves the firm performance. This finding is also consistent with the findings of Berger and Di Patti (2006) for France and Weill (2008) for Belgium, France, German, Norway and Spain. Calculating the economic significance from column (1), we found that incrementing leverage by one-standard deviation increased the firm's profitability by 11 % of its mean.

More importantly, the estimated coefficient on long term debt (*LTLEV*) was positive and statistically significant, providing support to our hypothesis H<sub>2</sub>. In addition, calculating the economic significance from column (1), we found that incrementing the proportion of long-term debt by one-standard deviation increased the firm's profitability by 10.7 % of its mean. This finding agrees with the findings of Schiantarelli and Jaramillo (1996), Schiantarelli and Sembenelli (1997) and Schiantarelli and Srivastava (1996) who estimated an augmented Cobb-Douglas production function with leverage and maturity and found that short-term debt is not conducive to improve productivity but long term debt helps improve firm level total factor productivity (TFP) for Italy and the UK, India and Ecuador, respectively. This finding was also consistent with Hart and Moore (1995) who showed short-term debt could facilitate managerial empire building thereby decreasing the firm performance, whereas long term debt played an opposite role. Additionally, Schiantarelli and Srivastava (1996) suggested that access to long-term debt may improve firms' productivity by allowing firms access to better and more productive technologies, which the firm may be reluctant to finance with short-term debt because of fears of liquidation and by removing the burden on the working capital, which may have adverse consequences on productivity. More recent research provided evidence suggesting that relaxing credit constraints and extending debt maturities could improve real investment in crisis period (Campello et al., 2010). Even in non-crisis times, long term debt allows firms to mitigate the potential rollover risk related to short maturity debt (Diamond, 1991).

Table-3. Leverage, debt maturity and corporate performance measured by return on assets (ROA).

Variables	Full sample	Non-state controlled firms	State controlled firms
	(1)	(2)	(3)
ROA <sub>it-1</sub>	0.415*** (0.034)	0.465*** (0.055)	0.493*** (0.113)
ROA <sub>it-2</sub>	0.086*** (0.027)	0.056 (0.050)	0.032 (0.048)
TLEV	0.044* (0.024)	0.110*** (0.039)	-0.056** (0.028)
LTLEV	0.052* (0.031)	0.124* (0.063)	0.012 (0.027)
SIZE	-0.001 (0.003)	-0.011 (0.008)	0.006 (0.004)
TANG	0.069*** (0.019)	0.016* (0.09)	0.057 (0.043)
SALGRTH	0.047*** (0.012)	0.029** (0.014)	0.047*** (0.016)
INVENT	-0.016* (0.009)	-0.028** (0.013)	-0.006 (0.015)
LIQ	0.125*** (0.031)	0.154** (0.067)	0.042 (0.050)
FAGE	-0.005* (0.003)	-0.006 (0.007)	0.001 (0.004)
Regional fixed effects	yes	yes	yes
Industry fixed effects	yes	yes	yes
Year fixed effects	yes	yes	yes
Firm fixed effects	yes	yes	yes
Observations	6271	1990	4281
Hansen test (p values)	0.369	0.736	0.205
m1 (p values)	0.000	0.000	0.000
m2 (p values)	0.155	0.179	0.191

Notes: Asymptotic standard errors robust to heteroskedasticity are reported in parentheses. The system GMM estimator was used to estimate all equations, *AR2* is a test for second-order serial correlation of the differenced residuals, asymptotically distributed as  $N(0, 1)$  under the null of no serial correlation. The Hansen *J* test of over-identifying restrictions is distributed as *Chi-square* under the null of instrument validity. We treat all right-hand side variables except firm age and dummy variables as potentially endogenous. A firm is defined as state-owned if the state is identified as its ultimate owner. \*\*\*, \*\*, and \* denote significance levels of 1%, 5%, and 10%, respectively. See Table A1 in the Appendix for definitions of all variables.

In addition, we examined whether the impacts of leverage (*TLEV*) and the proportion of long-term debt (*LTLEV*) on firms' performance differ between the sub-sample of state and non-state firms. As can be seen in Table 3, leverage (*TLEV*) and the proportion of the long-term debt (*LTLEV*) have a positive impact on firm's performance of private firms. Yet, leverage (*TLEV*) negatively affects performance of state-controlled firms, whereas the coefficient estimate for the proportion of the long-term debt (*LTLEV*) is no longer significant at conventional levels. These results suggested that the leverage and its maturity serve as governance mechanisms to constrain agency conflicts and, consequently, improve firm performance only for privately controlled firms in China.

Turning to the control variables, the estimated coefficients of the natural logarithm of firm size (*SIZE*) were not statistically different from zero at conventional levels of significance in all columns of Table 3. Tangibility (*TANG*) was positively related to *ROA* in columns (1) and (2), but the coefficient of tangibility was insignificant in column (3). The estimated coefficient of sales growth (*SALGRTH*) was significantly positive in columns (1)-(3). The inventory to assets ratio (*INVENT*) as negatively related to *ROA* in columns (1) and (2). The coefficient associated with firm's cash and cash equivalent to total assets ratio (*LIQ*) was positively significant in columns (1) and (2) but not significant in columns (3) at conventional levels of significance. Finally, the coefficient of firm age was negatively significant in column (1) and but not significant in columns (2) and (3). These results suggested that larger, more liquid firms with better growth opportunities are characterized by better performance.

*Robustness tests*

In analyses not reported for the sake of brevity, we noted that our results in Tables 3 were also robust in estimating Equation 1 by replacing the return on assets (ROA) with return on sales (*ROS*) and our productivity measure (*PROD*) which is measured by real sales divided by total number of employees. We also distinguished the effects of debt and maturity structure on firms' performance between the pre and post-split share structure reform period. In unreported results, we found that leverage and maturity mainly affect the performance of Chinese listed firms in the post-reform period, suggesting that in the early period of institutional change, debt did not act as a disciplining mechanism to mitigate conflicts between managers and shareholders, but, in the later period, debt became as an effective disciplining device in constraining managers' opportunistic behavior when institutions had become more market oriented.

**6. CONCLUSIONS**

Corporate finance literature suggests that debt financing can be an effective mechanism to mitigate agency cost of equity by aligning the interests of managers with that of shareholders. However, it creates agency costs of debt, for example underinvestment problems stemming from the conflicts of interest of shareholders and bondholders. In addition, the research also focuses on the effects of debt maturity on the agency conflicts and corporate performance.

In this paper, using a large panel of Chinese listed firms over the period 2003-2010, we examined the impact of debt and debt maturity structure on corporate performance, which we measured by profitability measures (namely, return on assets (*ROA*) and return on sales (*ROS*) and a labour productivity measure proxied by total real sales divided by number of employees.

Using the system GMM estimator to control for unobserved heterogeneity, and the possible endogeneity of regressors, we observed a positive relationship between leverage and the proportion of long-term debt, on the one hand, and firm performance, on the other. Our results indicated that leverage and its maturity structure are important determinants of the performance of Chinese listed firms. When differentiating between state and private controlled firms, we found that leverage and long debt maturity positively affected corporate performance for private controlled firms, while leverage negatively affected corporate performance for state controlled firms.

Our research has significant policy implications in that it suggests that lenders such as banks may extend more long-term credit to the more productive private sector, which helps to improve the performance of these firms. Our study also suggests that the banking system reform initiated by the Chinese government since the country's accession to the WTO has yielded remarkable success in terms of improving the governance and operational efficiency of commercial banks.

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## APPENDIX

**Table-A1.** Definitions of variables.

Variables	Anonyms	Measures	Expected sign
<b>Dependent Variable</b>			
<b>Performance</b>			
Return on assets	ROA	Operating income before interest, tax and depreciation/ year-end total assets.	
Return on sales	ROS	Operating income before interest, tax and depreciation/ sales	
Productivity	PROD	Real sales/ total number of employees	
<b>Independent variables</b>			
Leverage	TLEV	Total leverage/ total assets	+(H1)
Short-term debt	PROP_STLEV	Short-term liabilities/ total liabilities	-(H2)
Long-term debt	PROP_LTLEV	Long-term liabilities/ total liabilities	+(H2)
<b>Control variables</b>			
Size	SIZE	Natural logarithm of total real asset	+
Tangibility	TANG	Fixed assets/ Total assets	+
Sales growth	SALGRTH	Changes in sales /Total real sales <sub>t-1</sub>	+
Inventory	INVENT	Inventory/ Total assets	-
Liquidity	LIQ	Firm's cash and cash equivalent scaled by its total assets	+
Firm age	FAGE	Natural logarithm of the number of years since the establishment of the firm	-
Regional dummies	$v_r$	Dummies indicating whether the firm is located in the Coastal, Western, or Central region of China	
Year dummies	$v_t$	Year dummies for the years 2005 to 2010.	
Industry dummies	$v_j$	Dummies for the following four industrial groups based on the CSMAR B classification: Properties, Conglomerates, Industry, Commerce. Utilities and financial industries are excluded.	

**Note:** '+' means that the firm's performance increases with the variables, '-' means that the firm's performance decreases with the variables. Real sales/assets are derived from the nominal figures using the deflator for China's GDP.

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