Collateral, Leverage, and Corporate Investment

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Abstract: This paper empirically investigates the role of collateral as a governance mechanism in mitigating investment distortions using Chinese setting which allows us to distinguish secured debt and unsecured debt. We find that the use of collateral enhances the negative relation between leverage and investment. We further show that this effect exists only in firms with limited investment opportunities and abundant free cash flows. We also find that the use of collateral in China is consistent with the moral hazard model where low quality firms are more likely to pledge collateral. In addition, our evidence suggests that although state-owned firms are less likely to use collateral in obtaining debt, once used, collateral has a positive role in mitigating over-investment.

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1. Introduction

The association between financing and investment is a fundamental question in corporate finance. However, the knowledge on the precise mechanisms behind this association is limited. In this study, we focus our attention on the relation between leverage and investment and by taking a close look on a specific mechanism through which leverage mitigates investment distortions arising from the agency cost of debt.

Previous literature has argued that leverage and investment are strongly related because of debt overhang created by prior debt financing and/or disciplinary role of debt on managerial discretion over free cash flows (e.g., Myers, 1977; Jensen, 1986; Stulz, 1990). Consistent with theoretical predictions, empirical evidence suggests that investment is negatively related to leverage, especially for low q firms (e.g., Lang, Ofek, and Stulz, 1996). However, prior empirical studies are largely silent on which feature of debt constrains investment. In other words, how leverage and investment are related is still unclear. Since collateral is a prominent feature of bank loan contracts around the world, this paper exploits the role of collateral on corporate investment policy.[1]

For secured debt, lenders hold the title to pledged assets until the lenders are paid in full, thus collateral enables the creditor to recover, fully or partially, a loan made to a debtor when a debtor defaults on making a contractual payment. This right to repossess

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[1] For example, collateral is an important part of more than 70% of all commercial and industrial loans made in the United States (see Berger and Udell, 1990). This figure is 62% in Germany (Harhoff and Korting, 1998). In Spain, the proportion of loans with collateral is 30.5% in short-term loans and 50.8% in long-term loans (Jimenez, Salas, and Saurina, 2006).

collateral gives lenders a credible threat to ensure that borrows will not misbehave. Previous literature suggests the presence of collateral in bank loan (or bonds) agreements is motivated to mitigate the costs of information and agency. In particular, arguments have been made that collateral-based lending can reduce both the ex ante debt overhang problem (underinvestment) and the ex post overinvestment problem (e.g., Smith and Warner, 1979; Stulz and Johnson, 1985; Hart, 1995；Hart and Moore, 1995). Thus, theoretically, collateral, the ubiquitous feature of financial contracts worldwide, presents a specific mediatory mechanism through which leverage and investment are related.

We investigate how collateral affects the relationship between leverage and investment using firm-level panel data from China's listed sector over the period 1999-2007. There are several reasons for using the Chinese setting. First, collateral is likely to play a more import role in addressing agency problems in countries with weak protection of creditor rights. In absence of collateral, it could be hard for lenders in these countries to cover their loss through other legal mechanisms (e.g., court judicial system, liquidation, etc.) in the event of default. Second, in China, mandatory disclosure regulation requires listed firms disclose the type and the amount of the un-repaid bank loan at the end of fiscal year in their annual reports, which allow us to distinguish secured debt balance and unsecured debt balance at the firm level. This provides a unique opportunity to examine the associations among collateral, leverage, and investment. This unique set of information on the security status of debts is not available in many countries, e.g. U.S. Finally, China's listed firms are more likely to rely on bank

loans to finance their investment because SEO regulation and underdeveloped bond market. This reinforces the importance of understanding the relation between bank debt and investment.

We use two variables, *Collateral dum* and *Collateral ratio*, to measure the influence of collateral on investment-leverage relation. *Collateral dum* is coded 1 for firm-years with secured debts, and 0 if no secured debts. *Collateral ratio* is the ratio of the amount of secured debt to the amount of total bank loans. We regress investment on leverage, collateral indicator, the interaction term between leverage and the collateral indicator, and a battery of control variables. We find that collateral enhances the negative relation between leverage and investment. This effect holds in various of checks of robustness. In order to further understand the mechanisms through which collateral affects investment-leverage relation, we investigate whether the relations among collateral, leverage, and investment vary systematically with some ex ante of proxies of agency cost of debt. We find that only in firms more likely to subject to over-investment problems (low investment opportunities, and/or high free cash flow), collateral strengthens the negative relation between debt and investment. While in firms where over-investment problem is not very serious, collateral does not affect the relation of debt and investment. Our results therefore support the argument that collateral play a disciplinary role in constraining managers' discretion over investment out of free cash flows, and thus mitigating investment distortions arising from agency cost of debt (e.g., Myers, 1977; Jensen, 1986; Stulz, 1990;Hart and Moore, 1995).

However, it is important to recognize that the use of collateral in debt financing is

endogenous with investment decisions and the investment opportunity in investment equation is likely to be measured with error. To rule out some alternative hypothesis and to mitigate the omitted variables problems, we introduce various proxies for financial health into the investment equation. Sub-sample analysis also help to identify the mechanism how collateral affect the investment-leverage relation. In addition, our interest is to examine the coefficient on the interaction term between leverage and the collateral indicator. Raddatz (2006) points out that it is less likely to have an omitted variable correlated with the interactive term than with the linear term. Thus, from an economic perspective the interactive term approach is less subject to endogeneity concerns (Claessens and Laeven, 2003). Nevertheless, we acknowledge that the negative relationship between secured debt and investment not necessarily suggest strong casual connection because we have no prefect way of identifying exogenous variations in secured debt choice.

As an extra analysis, we check the determinants of collateral in China. We find that firms with higher financial risks are more likely to use collateral, which is consistent with moral hazard theories and previous empirical literature. In addition, state ownership reduces the use of collateral. Even so, the use of collateral helps to discipline the managers of state controlled listed firms.

Our paper is the first, to the best of our knowledge, to empirically investigate the influence of collateral, a specific characteristic of debt, on the relation between leverage and investment. Our findings suggest that collateral play an import role in reinforcing the disciplinary ability of debt on managerial discretion over investment. Our evidence

therefore is helpful in understanding the role of debt contract in markets with weak protections of creditors' rights.

Prior empirical studies on collateral focus primarily on collateral and loan riskiness, the determinants of collateral, and the pricing of collateral (e.g, Berger and Udell, 1990; Jimenez, Salas, and Saurina, 2006; Booth and Booth, 2006; Benmelech and Bergman, 2009; Berger, Frame, and Ioannidou, 2011). Little attention has been paid to differences in the consequences of resource allocation between secured debt and unsecured debt. Our findings fill this void by providing evidence that collateral mitigates the distortion in investment decision due to agency costs, therefore improves resource allocation.

Our finding also related to literature on debt covenants and investment. Recently, studies document that debt covenant violations are associated with the sharp decline in investment (e.g, Chava and Roberts, 2008; Nini, Smith, and Sufi, 2009; Demiroglu and James, 2010), consistent with the theory of incomplete financial contracting on the state-contingent allocation of control rights developed by Aghion and Bolton (1992), Hart (1995), among others. We provide evidence on the impact of a specific loan covenant on investment by focusing on collateral requirement.

Finally, our study provides empirical evidence on the use of collateral in an emerging market. The current empirical evidence on collateral is mainly from the developed economies with the exception of Thai evidence provided by Menkhoff, Neuberger, and Suwanaporn (2006). Our study investigates the determinants of collateral and the role of collateral in corporate investment in the largest emerging economy of China. China is an important counterexample to the findings in the law, institutions, finance, and growth

literature (Allen, Qian, and Qian, 2005), where the government controls the banking system. In such an institution, will the role of collateral be strengthened or weakened? We find that, although state-owned firms are less likely to use collateral in obtaining debt, once used, collateral has a positive role in mitigating over-investment.

The remainder of the paper is organized as follows. Section 2 briefly reviews the related literature and analyzes the underlying theories. Section 3 introduces the lending practice in China's banks. Section 4 describes our sample and provides descriptive statistics for the sample firm. In Section 5 we empirically investigate the impact of collateral on the associate between leverage and investment. Section 6 examines the determinants of collateral. Section 7 concludes.

2. Leverage, investment, and the role of collateral

In their seminal paper, Modigliani and Miller (1958) argue that financing and investment decisions are completely separable in perfect capital markets. However, a number of studies show that leverage and investment are strongly related in an imperfect world. Myers (1977) concludes that, in extreme cases, debt creates underinvestment incentives since positive net present value (NPV) projects can go unfunded with a sufficiently high level of leverage. Alternatively, in an agency setting, Jensen (1986) and Stulz (1990) suggest that debt servicing obligations help to discourage overinvestment of free cash flow by self-serving managers.

Empirical evidence shows a negative association between leverage and future investment. For example, Denis and Denis (1993) find a significant reduction in

investment following a large increase in leverage induced by leveraged recapitalizations. They attribute these findings to the monitoring role of debt, which limits managerial discretion. Using a larger sample of firms in the U.S., Lang, Ofek, and Stulz (1996) also report a negative relation between leverage and future growth. However, this negative relation between leverage and investment exists only for low q firms. Therefore, they conjecture that leverage does not constrain those firms with good investment opportunities, which is consistent with the disciplinary role of debt. Ahn, Denis, and Denis (2006) also document a negative relation between leverage and investment in diversified firms. Finally, Aivazian, Qiu, and Ge (2005a) and Firth, Lin, and Wong (2008) provide evidence that leverage associated with investment in Canadian and China.

In presence of information and agency problems of debts, collateral is designed as an important debt contract provision. The use of collateral has arisen as a consequence of adverse selection (e.g, Bester, 1985; Chan and Kanatas, 1985; Besanko and Thakor, 1987a, b), and/or moral hazard (e.g., Chan and Thakor, 1987; Boot, Thakor, and Udell, 1991). If lenders are able to observe a borrower's credit quality, the probability of using collateral in the credit contract is higher for borrowers with observed lower credit quality (Boot, Thakor, and Udell, 1991). However, when credit quality among borrowers is private information (i.e., unobserved), theory predicts that high quality borrowers will use collateral to signal their quality and by this means obtain a lower interest rate.

In essence, most of borrower-based models of collateral assume agency cost is the main consideration in financial contracting. For example, borrowers may have the incentives to divert the money borrowed to their own consumption. The right to

repossess collateral gives lenders an essential threat to ensure that borrowers will not indulge in this misbehavior. This disciplinary role of collateral is central in the incomplete financial contract models (Aghion and Bolton,1992; Hart, 1995; Hart and Moore, 1995, 1998).

We conjecture that collateral can enhance the disciplinary benefit of debt, consequently, reinforce the negative relation between leverage and investment, in particular for firms to be more likely to overinvest. Smith and Warner (1979) argue that the issuance of secured debt can control the incentives for stockholders to take projects which reduce the value of the firm. Since lenders hold the title to the assets, secured debt offers a way to limit asset substitution. In addition, for fear of losing valuable collateral, a firm's managers will reduce their discretionary overinvestment of free cash flow (Hart and Moore, 1998). More generally, most existing models of collateral assume that collateral mitigate the ex post agency conflicts between borrowers and lenders. Therefore, in the context of interactions of corporate financing and investment decisions, we argue that secured debt have more potential ability to control overinvestment of free cash flow than unsecured debt.

However, some previous studies have warned against the potential shortcoming of the use of collateral. For example, Manove, Padilla, and Pagano (2001) argue that banks protected by collateral may perform too little screening of the projects that they finance. In other words, collateral and screening are substitutes from the point of view of banks. Following a similar intuition with Jensen and Meckling (1976) that corporate insiders owning only a fraction of the firm's equity have incentives to consume perquisites

beyond optimal levels, John, Lynch, and Puri (2003) model that managers may have an incentive to consume more perquisites out of the secured than unsecured assets. For example, borrowers may reduce the maintenance of the assets or increase managerial perk consumption from such assets.[2] These alternative predictions on the relation between collateral and agency costs reinforce our motivation for examine empirically the impact of secured debt on investment policy.

The issuance of secured debt requires suitable collateral to be available. One possible explanation for the negative relation between secured debt and investment is that borrowers with high level of secured debt use up their available collateral. Consequently, when new investment opportunities presents, borrowers have no additional debt capacity to further issue debt, which, in turn, reduces future investment (Rampini and Viswanathan, 2010). However, borrowers may use the project to be financed as the collateral (Almeida and Campello, 2007). Thus, the impact of secured debt on underinvestment may be not serious. More importantly, even though this underinvestment argument holds, one would predict that the negative relation should be more prominent in high-growth firms rather than in low-growth firms.

3. Lending practice in Chinese banks

After the establishment of People's Republic of China, the country's banking system was centralized under the Ministry of Finance, which exercised firm control over all financial services, credit, and the money supply. During the 1980s the banking system

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[2] It is worth noting that the nature of the pledged asset can be import in the scenario of John, Lynch, and Puri (2003). If collaterals have values that are largely unaffected by managerial actions (e.g., land and buildings), this agency problem should be not serious.

was expanded and diversified to meet the needs of the reform program. Today, China's banking system consists of multi-level banks, serving various levels of customers, and providing most of the finance to the firms.[3] As of end-2010, the total banking assets registered RMB 95 trillion, the total deposits recorded RMB 73 trillion, and total loans outstanding RMB 51 trillion (CBRC, 2010).[4] As the end of 2010, the total bank loan outstanding is 128% of 2010's GDP, while the stock market capitalization as the end of 2010 is only 67% of 2010's GDP. Therefore, bank loan is the overwhelming source of finance by firms in China.

However, due to historical reasons, the Chinese banks still subject to a number of problems, such as low profitability, low assets quality, weak corporate governance, and heavy influence and burden from the government. It is widely documented that, due to bank discrimination and the SEO quota system, state controlled firms in China have better access than privately controlled firms to bank loans (e.g., Cull and Xu, 2003; Brandt and Li, 2003; Allen, Qian, and Qian, 2005; Ge and Qiu, 2007; Ayyagari, Demirgug-Kunt, and Maksimovic, 2010; Guariglia, Liu, and Song, 2011). In addition, the bank loan market is lack of efficiency. For example, Bailey, Huang, and Yang (2011) find that poor financial performance and high managerial expenses increase the likelihood of obtaining a bank loan, and bank loan approval predicts poor subsequent borrower

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[3] As of end-2010, China's banking sector comprises of two policy banks and China Development Bank (CDB), five large commercial banks, 12 joint-stock commercial banks, 147 city commercial banks, 85 rural commercial banks, 223 rural cooperative banks, 2,646 rural credit cooperatives (RCCs), one postal savings bank, four banking assets management companies, 40 locally incorporated foreign banking institutions, 90 foreign bank branches, 63 trust companies, 107 finance companies of corporate groups, 17 financial leasing companies, four money brokerage firms, 13 auto financing companies, four consumer finance companies, 349 village or township banks, nine lending companies and 37 rural mutual cooperatives. Overall, banking institutions numbered 3,769, possessing 196,000 business outlets and 2.991 million employees (*China Banking Regulatory Commission, 2010 Annual Report*, downloadable at http://www.cbrc.gov.cn/showannual.do).

[4] CBRC is the abbreviation for China Banking Regulatory Commission. See *CBRC 2010 Annual Report* downloadable at http://www.cbrc.gov.cn/showannual.do.

performance. Finally, the loan pricing ability of banks is limited. In China, the central

bank, People's Bank of China sets upper bonds for deposits and floor rates for loans. Due

to the reasons discussed above, the collateral is of special importance in China. Firms

can use their land-use right, properties, equipment, inventories and other assets as

collateral. As land and improvements over land (i.e. building property) is perhaps the

most important pledged assets in terms of value, it is necessary to discuss briefly this

type of collateral.

According to Chinese laws, land in the urban areas is owned by the State and land in

rural and suburban areas is owned by peasant collectives.[5] A natural person or a legal

person only possesses the right to use the land. The law defines the maximum term with

respect to the assigned right to use the land for the industrial purpose is 50 years.[6] In

practice, the market for the trading of land-use right is active and impressive. For

example, the total transaction area for state-owned land-use right is about 165,859

hectares and the total transaction value is 1.03 trillion RMB in 2008.[7] Chinese laws

clearly prescribe that the land-use right can be mortgaged and state that "with the

mortgage of the land-use right, the above-ground buildings and other attached objects

thereon shall be mortgaged accordingly".[8] It is worth noting that the land-use right is

important to both stated-owned firms and private firms. Typically, firms originally

obtain the land-use right from the government department (e.g., Department of Land

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[5] See *article 8 of Land Administration Law of the People's Republic of China* (issued by the Standing Committee of the National People's Congress, June 25, 1986, last revisited August 28, 2004).
[6] See *article 11 of Interim Regulations of the People's Republic of China Concerning the Assignment and Transfer of the Right to the Use of the State-owned Land in the Urban Areas* (issued by the State Council, May 19, 1990).
[7] See *China land and resources statistical yearbook of 2009* (pp.172).
[8] See *article 32-33 of Interim Regulations of the People's Republic of China Concerning the Assignment and Transfer of the Right to the Use of the State-owned Land in the Urban Areas*, (issued by the State Council, May 19, 1990). In addition, *The Guarantee Law of the People's Republic of China* also has similar rules (see article 34).

and Resource) through bid or government allocation with the approval of the people's governments at and above the county level according to law. Subsequently, the land-use right can be self-used, transferred, leased, and mortgaged by the firms. Since the property price is on the rise in the past decades, the land-use right is a very valuable asset for Chinese firms.

According to the laws in China, in the event of a borrower defaults on making a contractual payment, banks can seize and sell the collateral to remedy the losses. The *Guarantee Law of the People's Republic of China*，effective on October 1, 1995, provides details rules and applications for the use of collateral in debt contract. For example, according to article 53 of the law, when the deadline of a debt payment expires, the mortgagee can be paid off, with the agreement of the mortgagor, by converting the value of objects of pledge into money or by proceeds acquired through an auction, or sales of the objects; If the mortgagor and the mortgagee fail to reach an agreement, the mortgagee can file litigation with the people's court. To demonstrate more specifically, , let us introduce briefly a case of Chinese listed firm, JIFA.[9] JIFA, a Jilin provincial government controlled company, was listed in the Shanghai Stock Exchange in April 1996. The controlling shareholder of JIFA is the Jilin Province Development and Construction Investment Company (hereinafter referred to as the JDCI). In 1998, the listed firm JIFA obtained a loan from Agricultural Bank of China (one of the big 4 state owned banks in China). The amount of the loan was 50,000 thousand RMB, the maturity was one year. The controlling shareholder, JDCI, pledged its three house properties as

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[9] The full name of the company is: Jilin Province JIFA Agricultural Development Group Co. Ltd. The company's stock code is: 600893.

collateral for this loan. In 1999, JIFA did not repay the loan since financial distress. In Dec. 2001, under the arbitration by local court, Agricultural Bank of China, JIFA, and JDCI made an agreement.[10] According to the agreement, JDCI's pledged assets (three house properties) were transferred to Agricultural Bank of China at the price of 45,210 thousand RMB, and the remaining principal and interest (approximately 13,000 thousand RMB) should be repay by JIFA in the future. In 2002, JIFA repay the loan by cash and other physical assets. Based on above analysis, we argue that collateral is of special importance in bank loan contracting in Chinese lending practices.

4. Research Design

4.1. Measuring collateral

According to the disclosure requirement of the CSRC,[11] Chinese listed firms should disclose separately the type and the amount of bank debt in the notes to the financial statements, specifically, in the notes to three accounts (short-term borrowing, long-term loans due within one year, long-term loans (over one year)).[12] Table A1 in Appendix gives a case of bank debt information disclosure in listed firms using the data in the year 2004 annual report of Tsinghua Tongfang (stock code: 600100).

As can be seen in table A1, we can hand-collect these data and split the bank debt into secured debt and non-secured debt (borrowing on credit and guarantee) at the end of year for each firm-year observations. We create two collateral indicators. One is

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[10] See Shanghai Securities News (Jan. 23, 2002) or the year 2002 annual report of JIFA.
[11] CSRC is the abbreviation for China Securities Regulatory Commission.
[12] For the full text of the regulation, see *Public Offering Company information disclosure content and format guidelines No.2—content and format of the annual report* (issued by the CSRC, Dec. 18, 1999, last visited Jan. 10, 2010).

Collateral dum, which equals one if the firm has non-zero secured bank debt (i.e,

collateral-based bank debt) at the end of the year, and zero otherwise. The other is

Collateral ratio, which measures the ratio of the secured bank debt to the total bank debt

at the end of the year. For example, in the case of Tsinghua Tongfang at the end of the

year 2004, the *Collateral dum* is one, and the *Collateral ratio* is the 0.0137.

4.2. Sample construction

In this study, we use a sample of A-share listed companies on the Shanghai and

Shenzhen Stock Exchanges over the period 1999-2007. Our sample period starts from

1999 because China's listed companies have to disclose full annual reports on the

internet since 1999, and we need full annual reports to hand-collect the type and the

amount of bank debt from the footnotes to the financial statements. Before that, China's

listed companies typically disclosed simplified annual reports in specified newspapers

such as the *China Securities Journal*. We cannot obtain the precise information on the

type of bank loan in simplified annual reports. After excluding financial firms and

observations without bank debt or with insufficient data to calculate collateral

indicators we have 9,993 firm-year observations from 1,522 unique firms. The financial

statement data and stock price data come from the China Stock Market & Accounting

Research Database (CSMAR).

4.3. Empirical specification

In order to examine the relation among collateral, leverage and investment, we use the

following general regression specification:

$Investment_{i,t+1} = \beta_0 + \beta_1 C_{it} + \beta_2 Leverage_{it} + \beta_3 C_{it} \times Leverage_{it} + \beta_4 Q_{it}$

$$+\beta_5 \textit{Cash flow}_{i,t+1} + X_{it}\gamma + \eta_i + \nu_{t+1} + \varepsilon_{i,t+1} \qquad\qquad (1)$$

Where *Investment*$_{i,t+1}$ is the ratio of capital expenditure to lagged total assets,[13] C_{it} is the collateral indicator (*Collateral dum* or *Collateral ratio*), *Leverage*$_{it}$ is the ratio of the total bank debt to total assets at the end of the year, Q_{it} is the generally average Q as presented by a market-to-book ratio of asset values, *Cash flow*$_{i,t+1}$ is a measure of cash flow, X_{it} is a vector of other control variables, η_i represents firm fixed effects, ν_{t+1} represents year fixed effects, and $\varepsilon_{i,t+1}$ is the random error term.

We predict that leverage is negatively associated with investment and collateral should reinforce this negative relationship. We test this prediction by examining if the coefficient on the interaction term of leverage and collateral indicators, which represents the impact of collateral on the association between leverage and investment, is negative (i.e., $\beta_3 < 0$).

For the coefficient on collateral indicators (i.e., β_1), if the collateral conveys information about firm future financial distress (e.g, Rajan and Winton, 1995) and the information do not absorbed by our control variables (e.g., Tobin's q and cash flow), the coefficient should be less than zero (i.e., $\beta_1 < 0$). Alternatively, ex ante collateral theories argue that unobservable lower risk borrowers are more likely to pledge collateral. Hence, if collateral serves as a method of reducing ex ante asymmetric information that allows lender to sort observationally equivalent loan applicants through signaling, we predict

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[13] Investment is scaled by the lagged book value of total assets because all variables can be normalized by the same quantity, and it is most natural to measure leverage as the ratio of debt to total assets rather than the ratio of debt to the value of fixed capital or property, plant, and equipment. As a robust check, we also use the changes in fixed assets scaled by the lagged net fixed assets as a measure of investment (as used in Fazzari, Hubbard and Petersen (1988) and Aivazian, Ge, and Qiu (2005a)). The results are similar.

the coefficient should be greater than zero (i.e., $\beta_1 > 0$). [14]

To avoid a potential omitted variables bias in our estimated treatment effect, we first control the average Q (Tobin's q) and cash flow following a large investment literature (e.g., Fazzari, Hubbard, and Petersen, 1998, 2000; Kaplan and Zingales, 1997, 2000). These two variables should capture the variation in unobserved investment opportunities. In additional, the firm and year fixed effects mitigate the error of estimation derived from unobserved time-invariant firm individual effect and the variation in the firm's macro operating environment on the estimation.

Most of empirical evidence suggest observationally riskier borrowers have a greater propensity to make use of collateral, consistent with the moral hazard model (e.g., Berger and Udell, 1990, 1995; Harhoff and Korting, 1998; Jimenez, Salas, and Saurina, 2006; Berger, Frame, and Ioannidou, 2011). In addition, Rajan and Winton (1995) examine the effect of collateral on the lender's monitoring incentives. Monitoring is valuable in their model because it allows the lender to claim additional collateral if the firm is in distress. One empirical implication of their model is when borrower's distress approaches, the degree to which bank claims are secured increases. Moreover, previous literature also suggests that firms with abundant investment opportunities will select low leverage to reserve debt capacity for future financing (see, Harris and Raviv, 1991). In support of this, Smith and Watts (1992) and Billett, King, and Mauer (2007) show that investment opportunity and leverage are negatively related. Therefore, if secured debt

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[14] The potential assumption is that lower risk is positively related with more investment opportunities that are not fully captured by our control variables. Indeed, the less clear prediction for the β_1 reinforcing our motivation for focusing on the impact of collateral on the investment-leverage relationship rather than the impact on the investment.

constrains future debt capacity, high growth firms will select a low level of secured debt

ex ante so that their financing needs can be met in the future. Consequently, changes in

leverage and collateral may convey the information about firm's financial condition or

investment opportunities, which do not fully absorbed by Q and cash flow. In order to

mitigate the threat of the endogeneity, we also incorporate more financial condition

proxies such as firm size, Altman's Z-score, tangibility, firm age, Non-bank Liability, and

two stock market variables (*stock return* and *volatility*) to further control the effect of

omitted variables. If endogeneity is a problem we expect to find a significant decrease in

the magnitude of β_3 when these additional control variables are included. The

definitions of the variables used in the study are shown in Table 1.

Insert Table 1 about here

4.4. Descriptive statistics

In Table 2 we report summary statistics for the 9,993 firm-year observations. All

variables are winsorized at the 1st and 99th percentiles in order to remove the effects of

outliers. The mean of the investment ratio of China's listed companies is 7.2% and the

median is 4.3%. The leverage, the ratio of bank debt to book value of total assets, has a

mean value of 26.5% and a median of 25.0%. For collateral indicators, 69.7% of firms

use collateral in their borrowing, and among the total bank loans, on average 25.7% are

secured debt. Therefore, in China's listed companies, secured loans make up about one

fourth of total bank loans, which is substantially lower than those in western countries

(Berger and Udell, 1990; Harhoff and Korting, 1998; Jimenez, Salas, and Saurina,

2006).[15]

The maturity, another bank debt feature, constructed as the ratio of short-term bank debt to the total bank debt, has a mean of 79.4% and a median of 90.3%, indicating that China's banks extremely prefer to choose short debt maturity, consistent with the evidence provided by Fan, Titman and Twite (2011) which find China has the shortest debt maturity in 39 countries.

Q is constructed as the market value of total equity plus book value of total liabilities divided by the book value of total assets.[16] The mean Q for the sample is 2.465, and the median is 1.98. *Cash flow*, measured by the operating cash flow, is 5.5% of book assets at the mean and 5.1% at the median.[17]

Insert Table 2 about here

Table 3 shows the correlations among the variables used in this study. The investment is negatively correlated with leverage and collateral indicator. The high correlation between *Collateral dum* and *Collateral ratio* suggests that the choice of a collateral measure may not be very important. In additional, there is negative correlation between leverage and Q. Not surprising, investment are positively associated with cash flow and Q. As this table shows, the correlations between the regressors are not very high, indicating

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[15] However, note that Berger and Udell (1990), Harhoff and Korting (1998), and Jimenez, Salas, and Saurina (2006) report statistics on survey data for small- and medium-sized firms or unlisted firms. Our data are for publicly listed companies.

[16] Prior to the stock market reforms in 2006, domestic A-shares were divided into tradable and non-tradable shares. As a robust check, we also calculate Q as the sum of the market value of the tradable shares, the book value of the non-tradable shares, and the book value of liabilities, divided by the book value of total assets. The mean Q based on this method for the sample is 1.77 and the median is 1.33. Using this alternative measure of Q does not change the results of our study.

[17] As a robust check, we also use the sum of net income and depreciation as a measure of *Cash flow*. The results remain statistically similar. We prefer to operating cash flow over net income plus depreciation due to poorly performing firms have strong motivations to engage in earnings management in china (Liu and Zhou, 2007; Piotroski and Wong, 2010). An additional reason is that there have been changes in accounting standards that make net income less consistent over time.

that multicollinearity is not a serious problem in our study.

Insert Table 3 about here

5. Collateral, leverage, and investment

5.1. Basic results

In Table 4, we present the estimation results of investment on leverage, collateral indicators, their interaction, and other control variables. All specifications include both firm and year fixed effects. Column (1) of Table 4 reveals that leverage is negatively associated with investment, after controlling Q and cash flow. The coefficient on leverage is -0.109, significant on the 1% level, confirming the findings by prior studies (e.g., Lang, Ofek, and Stulz, 1996; Firth, Lin, and Wong, 2008).

Specification (2) and (3) incorporate collateral indicators (*Collateral dum* or *Collateral ratio*) to test if collateral affect the association between leverage and investment. Both regressions show that collateral significantly enhances the negative relation between investment and leverage. Given mean investment ratio (the ratio of capital expenditure to lagged total assets) of 0.072, the point estimate in Column (3) implies that when all the bank loans are unsecured, an increase of the ratio of bank loan to total assets by 0.1 will result in the decrease of investment ratio by 0.0097 (a 13.5% decline relative to mean of investment ratio). On the contrary, when all the bank loans are secured (i.e., *Collateral ratio*=1), an increase of the ratio of bank loan to total assets by 0.1 will reduce investment ratio by 0.0144 (a 20% decline relative to mean of investment ratio).

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Therefore, collateral is both statistically and economically significant in influencing the investment-leverage relation.

The results in Tale 4 show that the coefficients on collateral indicators are statistically insignificant. In untabulated tests, if we exclude the interaction term between leverage and collateral indicator in specification (2) and (3), both the coefficients on *Collateral dum* (the coefficient is -0.006) and *Collateral ratio* (the coefficient is -0.011) are negative and statistically significant at the 1% level. The findings indicate that effects of collateral on investment are derived chiefly from the channel through which collateral enhances the negative effect of leverage on investment.

Insert Table 4 about here

The final two columns in Table 4 attempt to further indentify the effect of collateral by including debt maturity and other non-bank liability into the specification. Shortening the debt maturity also helps to mitigate the stockholder-bonder conflicts over the investment decisions (Myers, 1977; Childs, Mauer, and Ott, 2005). Aivazian, Ge, and Qiu (2005b) show empirically that a higher percentage of long-term debt in total debt significantly reduces investment, especially for firms with high growth opportunities, consistent with the prediction of Myers (1977) that debt maturing after the expiration of the growth option causes underinvestment problems. Therefore, we control the effect of debt maturity by including the variable *Maturity* and the interaction term between *Leverage* and *Maturity* in Column (4) and (5). In addition, we also control the effects of other non-bank liability (e.g., account payable) on investment by including the variable *Non bank liability* measured as the total liability minus bank debt and scaled by the book

assets. The evidence in Column (4) and (5) suggests short-term debt and other liability are negatively associated with investment.[18] However, the coefficient on the interaction term between collateral and leverage still remain statistically significant. For the other control variables, not surprisingly, we find Q and cash flow have positive effects on capital expenditures, consistent with previous literature.

5.2. Robustness tests

In this section, we investigate the robustness of the results that include additional control variables in order to mitigate the effect of firm financial conditions, test whether our findings are affected by the inclusion of distressed firms, examine whether our main results are hold for the SOE sample, and the robustness of results over time.

5.2.1. Control financial conditions

As noted earlier, an alternative interpretation of the above results is that secured debt simply conveys information about financial distress (health) which can constrain capital expenditure in the future. That is to say, secured debt coincides with a decline in investment opportunities caused by the deteriorative financial condition. To ruling out the above argument, we conduct two tests. In the first test, we include in the regression several additional control variables that can be as proxies of financial condition. In general, larger firms are less likely to be financially constrained. Therefore, the variable *Size* partly picks up the effects of financial constraint attributed to firm size.[19] We also introduce *Altman's Z-scores*, a common indicator of financial health, into our regression

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[18] Our evidence on the effect of debt maturity is opposition with the findings of Aivazian, Ge, and Qiu (2005b). The reason may be that debt maturity conveys the information of high firm quality given that borrowers are difficult in access to long-term bank loan in China.

[19] Here we do not argue that lager firms have the higher investment ratio because smaller firms typically have superior investment opportunities and therefore invest more (Hovakimian, 2009).

specification. We predict less financially healthy firms tend to invest less. Campello and Hackbarth (2008) find that assets tangibility boosts investment spending when firms face financing constrains, thus we also control firm tangibility. The extant empirical evidence shows on average Chinese IPO firms report a decline in post-IPO profitability and poor long-run stock performance (e.g., Fan, Wong, and Zhang, 2007; Kato, Wu, and Yang, 2009), so we control the listing age. In addition, we also incorporate two capital market variables, namely, market-adjusted stock return and stock volatility, which reflect the firm specific information that has been incorporated into stock price but is not yet recognized in financial statements.

The second test is that we re-evaluate our results after excluding distressed firms. To do so, we delete firms that have non-zero overdue bank debt in the sample period and the firm-year observations with negative net income or operating cash flows, which resulted in a 5,415 firm-year observations.

As presented in Panel A and B of Table 5, the coefficients on the interaction term between leverage and collateral indicator are still negative and statistically significant. Compared with the results in Table 4 with those in Table 5, we find that collateral play more important role in enhancing the negative association between leverage and investment for financially healthy firms. For example, the coefficient on *Leverage× Collateral ratio* is -0.108 in column (4) of Table 5, more than double of the coefficient (-0.047) in the column (3) of Table 4. These robustness checks suggest that our findings cannot be explained by the story that secured debt only pick up negative information about financial conditions.

5.2.2. Analysis of state influence

In China, the government controls major commercial banks and it may direct these banks to give priority to state owned enterprises (SOEs) when making lending decisions. Thus, debt might not be able to discipline investment decisions in state owned enterprises. For example, Firth, Lin, and Wong (2008) find that firms with a higher proportion of shares owned by the state have a weaker negative relation between debt and investment. They conclude that this creates an overinvestment bias in government controlled listed firms. Under this background, can secured debt constrain the investment in state controlled firms? To investigate the influence of state ownership, we restrict our sample which only consists of the government controlled firm-year observations. We identify the ultimate controller of listed companies for our sample firm-years from data in the annual reports. If the ultimate shareholder is the government and its affiliated entities, then the firm is regard as government controlled. Among the 9,993 firm-years, 7,239 (about 72.4%) are identified as government controlled. Panel C of Table 5 presents the estimation results using government controlled sample. The results indicate that collateral strengthens the disciplinary role of leverage on investment even in government controlled firms.

5.2.3. Yearly analysis

As the largest transitional economy, China is experiencing dramatic economic revolution since 1978. The practice of bank lending continually changes in this age of reform. To investigate the robustness of our results over time, we estimate our

regressions annually and present the mean coefficients according to the distribution of yearly regression coefficients in Panel D of Table 5. The coefficients on the interaction term between leverage and collateral indicator are still significantly negative, indicating that our findings are unlikely to be driven by specific years.

5.3. Agency problems and the role of collateral

The above empirical evidence shows that collateral enhances the negative relation between leverage and investment. However, we do not yet evaluate whether the role of collateral is good or bad since our findings could be interpreted by the story that secured debt helps mitigate the overinvestment or by the story that secured debt deteriorates the underinvestment. As discussed earlier, we argue that collateral can enhance the disciplinary benefit of debt and therefore mitigate the problem of overinvestment on free cash flow. In line with this story, we expect that collateral should reinforce the association between leverage and investment for firms in which agency problems are relatively more severe.

The purpose of this section is to examine the role of collateral in the context of the agency problems created by different growth opportunities and free cash flow environments. Doing so enables us to move closer to understand the extent to which secured debt helps to mitigate the investment distortions brought by the underlying agency problems. In addition, this analysis also gives us a chance to avoid the concern on endogeneity as long as our ex ante proxies for agency problems are largely uncorrelated with future discontinuous variation of the residual in the investment specification, and therefore can provide a further support for a causal interpretation of our findings.

Using the well-known Q as a proxy for growth opportunities, prior literature has empirically identified the role of debt are different in different growth opportunities context (e.g., McConnell and Servaes, 1995; Lang, Ofek, and Stulz, 1996; Harvey, Lins, and

Roper, 2004). Firms with limited investment opportunities are more likely to be confronted with potential for overinvestment problems, thus a negative association between leverage and investment is consistent with the argument that leverage plays a disciplinary role to restrict managers of low growth firms from investing in non-profitable projects (Lang, Ofek, and Stulz, 1996; Aivazian, Ge, and Qiu, 2005a; Ahn, Denis, and Denis, 2006).

If collateral mitigates overinvestment problem, we predict that collateral should enhance the negative relation between leverage and investment in low Q firms. For this objective, we split the sample into firms with above- and below-median levels of Q by the industry and year. Panel A of Table 6 shows that the interaction terms between leverage and collateral indicator are negative and significant only for firms with limited growth opportunities. These results are consistent with the argument that collateral helps to discourage the investment of highly levered firms with poor or unrecognized investment opportunities by outside investors.

A possible interpretation for the above findings is that there is no variation in leverage and collateral for high Q firms which results in insignificant coefficients on the interaction terms between leverage and collateral indicator in column (3) and (4) of Table 6. However, we find the variations in leverage and collateral for high and low Q firms are similar. For example, the interquartile range in *Collateral ratio* for high Q firms is 0.482 around a median of 0.135 whereas the interquartile range for low Q firms is 0.393 around a median of 0.136. Similarly, the interquartile range in *Leverage* for high Q firms is 0.220 around a median of 0.226 whereas the interquartile range for low Q firms is 0.211 around a median of 0.273. Consequently, the variations do not explain why collateral intensify the negative association between leverage and investment for low Q firms but not for those with good investment opportunities.

The benefits of debt are greater if firms have abundant free cash flow (FCF) that can lead to overinvestment or the outright diversion of corporate funds (Jensen, 1986;

Bolton and Scharfstein, 1990; Hart and Moore, 1998). In panel B of Table 6, we also separately examine the relations among collateral, leverage and investment for firms with high FCF and for those with low FCF.   FCF is defined as cash flow in excess of that required to fund all projects that have positive net present values (NPVs) when discounted at the relevant cost of equity (Jensen (1986)). We measure FCF as cash flow from operations minus cash dividends then scaled by lagged total assets.[20] A firm-year observation is classified as high FCF if its FCF is higher than the industry median in that year, otherwise as low FCF. The results presented in column (5)-(8) of Table 6 show that interactions of collateral indicator and leverage are significantly negative only in high FCF group. Therefore, collateral enhances the negative investment-leverage relation only in firms with abundant cash flows where managers are apt to waste cash flows in low profitable projects.

In Panel C, firms are categorized both by investment opportunities and free cash flows. Firms that hold a lot of cash but do not have good investment opportunities are more likely to face potential agency problems from FCFs (Jensen, 1986). We therefore conjecture that collateral has greater impact on investment-leverage relation for firms with low Q and high FCF. The results reported in Panel C again support our hypothesis. For example, the coefficient on *Leverage×Collateral ratio* is -0.196 in column (10), greater than that in column (2) and column (6), indicating that secured debt is particularly effective at alleviating agency problems when firms are likely to suffer from overinvestment.

Insert Table 6 about here

To summarize, the results in Table 6 are supportive to the argument by Smith and Warner (1979) and Hart and Moore (1995) that the right to repossess collateral gives secured lenders an essential threat to ensure that borrowers will not indulge in

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[20] Likely to Chen, Chen, and Wei (2011), our measure of FCF does not subtract investments in capital expenditures or mergers and acquisitions. The FCF measure that subtracts these investments implicitly assumes that firms do not overinvest or underinvest. We also do not have good method to computing optimal investments.

overinvesting in unproductive projects.

6. The determinants of collateral

So far, our evidence suggests that collateral strengthens the role of debt as a governance mechanism in mitigating the problems of overinvestment of free cash flow in China. It is natural to ask what determine the use of collateral in lending in the biggest emerging market. In China, are the determinants of collateral similar with those in developed markets? Under a state-owned bank lending environment, will banks reduce their collateral requirements for state-owned enterprises in credit contracts due to soft budget constraints? This section attempts to provide empirical evidence on these issues.

6.1. Empirical model

The extant empirical literature relates the use of collateral to the measures of borrower risk and proxies for private information. Although theoretically there are different predictions on who uses collateral, lending practice in the banking community (e.g. Morsman, 1986) and academic empirical evidence suggest observable riskier borrowers make greater use of collateral, consistent with the moral hazard model (e.g., Harhoff and Korting, 1998; Chakraborty and Hu, 2006; Jimenez, Salas, and Saurina, 2006; Brick and Palia, 2007; Berger, Frame, and Ioannidou, 2011).

We use the following summarized model to examine the determinants of collateral in China:

$$C_{it} = f\ (Default\ risk_{it},\ GOV_{it},\ Debt\ terms_{it},\ Firm\ characteristics_{it}) \qquad (2)$$

Where C_{it} is the collateral indicator, i.e., *Collateral dum* or *Collateral ratio*. *Default risk* is composed of the three dummy variables that indicate the riskiness of the borrower:

Default at t, Default at t-1, and *Default at t+1. Default at t* takes the value of one if the firm has non-zero overdue bank debt at the end of year *t*, and zero otherwise. *Default at t-1* takes the value of one if the firm has non-zero overdue bank debt at the end of year *t-1* and has no overdue bank debt at the end of year *t*, and zero otherwise. *Default at t+1* takes the value of one if the firm has no overdue bank debt at the end of year *t* but has non-zero overdue bank debt at the end of year *t+1*, and zero otherwise. We hand-collect these data on the default situation (whether the firm has non-zero overdue bank debt at the year) from the listed companies' annual reports. The first two dummy variables capture observed low credit quality, i.e., the borrowers with past repayment problems are more likely to have delinquencies or defaults on future debt. We therefore predict the coefficients on the two variables should be positive.

Like Jimenez, Salas, and Saurina (2006), we also incorporate *Default at t+1* into the specification to test whether lenders (banks) have private information about credit quality of borrowers. For a borrower who did not have a loan in default in *t* but defaults in *t+1*, if the information about this borrower is unobserved by lenders, then ex ante theories on collateral predict that the coefficient on *Default at t+1* is negative because that unobservable riskier borrowers are less likely to pledge collateral (e.g, Bester, 1985; Besanko and Thakor, 1987a, 1987b; Chan and Thakor, 1987; Boot, Thakor, and Udell, 1991). In contrast, if lenders can ex ante observe the future default risk of the borrowers, then the coefficient on *Default at t+1* should be positive since lenders are more likely to require the riskier borrowers to pledge collateral. Consequently, the sign of the coefficient on *Default at t+1* depends on which proportion of cases predominates

(Jimenez, Salas, and Saurina, 2006).

GOV is the government control indicator. We use two variables to measures to the extent of the government's influence on a firm. First, we use a dummy variable, *SOE dum*, which is coded 1 for firm-year observations where the firm is ultimately controlled by a government institution and zero otherwise. We also use *State ownership*, the proportion of shares owned by state institutions, as a proxy for the extent of government influence. In a government-oriented lending environment, previous literature focused on China suggests that state-owned banks very often display discrimination biases in their lending to privately controlled firms (e.g., Brandt and Li, 2003; Cull and Xu, 2003; Allen, Qian, and Qian, 2005). Given private firms may suffer more serious credit rationing and collateral can be as a contracting tool to break credit rationing, we predict that SOEs are less likely to use the collateral in loan contract.

Debt terms include the bank debt (*Leverage*), debt maturity (*Maturity*), and other liability (*Non-bank liability*). *Firm characteristic* contains firm size (*Size*), financial health (*Altman's Z-score*), operating performance (*Cash flow*), investment opportunities (*Q*), percentage of tangible assets (*Tangibility*), listed age (*Age*), and two capital market variables (*Stock return* and *Volatility*). We predict that financially riskier firms are more likely to be required to pledge collateral.

6.2. Results

The results of our analysis of the determinants of collateral are reported in Table 7. In Panel A, the dependent variable is *collateral dum* and we report regression results using the random-effect Probit estimation. The change in probability of *collateral dum* (i.e.,

marginal effects) for each one of the independent variables holding all other independent variables at their sample means, [21] are displayed in brackets of Panel A. In Panel B, we employ a two-sided random-effect Tobit model to estimate the determinants of *Collateral ratio* which is left-censored at zero and right-censored at one. We also report marginal effects evaluated at the mean of the explanatory variables in brackets of Panel B. All specifications in Table 7 include year fixed effects and firm random effects.

Insert Table 7 about here

In all four specifications, the coefficients on two observed risk proxies (*Default at t* and *Default at t*-1) are positively associated with the use of collateral, consistent with the ex post theories on collateral that observably riskier borrowers are required to pledge collateral to mitigate the moral hazard problems. Similar with findings by Jimenez, Salas, and Saurina (2006), the coefficients on *Default at t*+1 are positive and statistically significant in column (1)-(4), indicating the likelihood of the use of collateral is higher for borrowers who have no default at present but default in the future. The findings suggest lenders may ex ante observe the credit quality of borrowers and integrate this information into the loan decisions.

Consistent with our prediction, we find government control reduce the use of collateral in debt financing. Both *SOE dum* and *State ownership* are negative and statistically significant at the 1% level, indicating that in China's financial system where major banks are controlled by the state the disciplinary role of debt is less stringent. The marginal effects presented in column (4) show, if *State ownership* is increased by one

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[21] If the independent variable is dummy variable, the marginal effect is estimated using a change in this dummy variable from zero to one.

standard deviation (approximately 23.6%), the decrease in collateral ratio is 0.032 (representing a 12.5% decline relative to mean of *Collateral ratio*). The evidence suggests the effect of government is economically important. Combined with the evidence in Section 5.2, we conclude that although state-owned firms are less likely to use collateral in debt financing, once used, collateral has a positive role in mitigating over-investment.

We also note that the *Leverage*, *Age, and Volatility* are positively related with collateral. In the same time, *Maturity*, *Tobin's Q*, *Altman's Z-score*, *Tangibility* and *Stock Return* are negatively related with collateral. Overall, the evidence is consistent with moral hazard model that firms with higher financial risks are more likely to use collateral. Therefore, except for the effect of government control, which is not investigated by prior literature, the pattern of collateral in debt financing in China is actually similar with the pictures described by Jimenez, Salas, and Saurina (2006), Berger, Frame, and Ioannidou (2011), among others.

7. Conclusions

Collateral is a prominent feature in debt financing worldwide designed to alleviate information and agency problems of debt. Although discussed extensively in theoretical models, the role of collateral in improving capital allocation has been largely silent in empirical studies. Drawn a sample from China's listed companies which allow us to distinguish secured debt and un-secured debt, this paper investigates the role of collateral as a governance mechanism in mitigating the investment distortion. We find that the use of collateral enhances the negative relation between leverage and

investment. And this effect holds after controlling other debt characteristics (i.e., maturity, non-bank liability), and a set of firm specific variables that represent financial health. The effect also exists in state controlled firms and is not driven by a specific year. We further show that this effect only exists only in firms with limited investment opportunities and abundant cash flows where agency problem of overinvestment tend to be more serious. Therefore, our results are consistent with the argument by Smith and Warner (1979) and Hart and Moore (1995), among others, that collateral can help reduce over-investment of free cash flow. We also find that in China's setting, the use of collateral is consistent with the moral hazard model where low quality firms are more likely to pledge collateral. Finally, in China, commercial banks are controlled by the government, collateral is used to a lesser degree in state controlled firms. Yet, collateral even disciplines managers in state controlled firms.

China's financial market has enjoyed a period of strong growth since the early 1990's. As predicted by Deutsche Bank (2009),[22] in ten years, China is likely to account for 13% of the banking market, over 16% of the stock market, and over 5% of the bond market worldwide.[23] Our results are helpful for understanding China's banking system and stock market. Around the world, bank loans are a main source of finance for companies (Mayer, 1990), state ownership of banks is common (La Porta et al., 2002), and collateral terms have great importance in lending practices. Therefore, our results for China may have implications or resonance for other countries, especially those that are emerging markets or transitional economies.

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[22] See Deutsche Bank's website
(http://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD0000000000239800.pdf).
[23] Allen, Qian and Qian (2007) conduct a comprehensive description of China's financial system.

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Appendix:

Table A1 Bank debt information disclosure: A case of *Tsinghua tongfang*

Account title	Dec.31, 2004	Dec.31, 2003
Short-term borrowing		
the type of borrowing		
borrowing on credit	1,400,000,000	949,000,000
borrowing on guarantee	506,130,000	386,099,809
borrowing on collateral	15,000,000	15,000,000
Total	￥1,921,130,000	￥1,350,099,809
Long-term loans due within one year		
the type of borrowing		
borrowing on credit		2,660,000
borrowing on guarantee	6,000,000	39,500,000
borrowing on collateral	6,943,800	6,943,800
Total	￥12,943,800	￥49,103,800
long-term loans due over one year		
the type of borrowing		
borrowing on credit	315,000,000	100,000,000
borrowing on guarantee	80,000,000	83,920,000
borrowing on collateral	10,000,000	6,943,800
Total	￥405,000,000	￥190,863,800

This table presents a sample of bank debt information disclosure in listed firms using the data in the year 2004 annual report of Tsinghua tongfang (stock code: 600100). In the footnote to financial statement, the firm discloses separately the type and amount of bank debt according to the requirement of the CSRC.

Table 1 Definition of variables

Variables	Descriptions
Investment$_{t+1}$	The ratio of capital expenditure in year t+1 to lagged total assets
Leverage$_t$	The ratio of total bank debt (secured and unsecured bank debt) to total assets at the end of year t.
Collateral dum$_t$	Equals one if the firm have non-zero secured bank debt (i.e., collateral-based bank debt) at the end of year t, and zero otherwise.
Collateral ratio$_t$	The ratio of secured bank debt to total bank debt at the end of year t.
Maturity$_t$	The ratio of short-term bank debt to total bank debt at the end of year t.
Tobin's Q_t	The market value of total equity plus book value of total liabilities divided by the book value of total assets at the end of year t.
Cash flow $_{t+1}$	The ratio of operating cash flow in year t+1 to lagged total assets.
Size$_t$	The log of the book value of total assets at the end of year t.
Altman's Z-score$_t$	The sum of (0.012X$_1$+0.014 X$_2$+0.033 X$_3$+0.006 X$_4$+0.999 X$_5$) at the end of year t. X_1 is the ratio of working capital to total assets, X_2 is the ratio of retained earnings to total assets, X_3 is the ratio of earnings before interest and tax to total assets, X_4 is the ratio of market value of equity to total liabilities, and X_5 is the ratio of sales to total assets.
Tangibility$_t$	The ratio of PPE to total asset at the end of year t.
Age$_t$	Number of years the firm has been listed.
Stock return$_t$	The cumulative market-adjust stock returns from January to December in year t.
Volatility$_t$	The standard deviation of the residuals from the market model estimated using daily return data over the year t.
Non-bank liability$_t$	The ratio of non-bank liability (e.g., account payable) to total assets at the end of year t. Non-bank liability equals total liability minus bank debt.
SOE dum$_t$	Equals one if the firm has a government institution as the controlling shareholder at the end of year t, and zero otherwise.
State ownership$_t$	The proportion of shares owned by state shareholders at the end of year t.
Default at t	Equals one if the firm has non-zero overdue bank debt at the end of year t, and zero otherwise.
Default at t-1	Equals one if the firm has non-zero overdue bank debt at the end of year t-1 and has no overdue bank debt at the end of year t, and zero otherwise.
Default at t+1	Equals one if the firm has no overdue bank debt at the end of year t but has non-zero overdue bank debt at the end of year t+1, and zero otherwise.

Table 2 Summary statistics (N=9993)

Variables	Mean	STD	25th	Median	75th
Investment$_{t+1}$	0.072	0.081	0.014	0.043	0.099
Leverage$_t$	0.265	0.160	0.145	0.250	0.365
Collateral dum$_t$	0.697	0.460	0	1	1
Collateral ratio$_t$	0.257	0.298	0	0.136	0.436
Maturity$_t$	0.794	0.257	0.663	0.903	1
Tobin's Q_t	2.465	1.562	1.406	1.980	2.966
Cash flow$_{t+1}$	0.055	0.092	0.007	0.051	0.103
Size$_t$	21.168	0.968	20.519	21.066	21.739
Altman's Z-score$_t$	0.622	0.445	0.329	0.511	0.776
Tangibility$_t$	0.350	0.196	0.200	0.326	0.485
Age$_t$	7.426	3.553	4.578	7.315	9.942
Stock return$_t$	0.002	0.524	-0.212	-0.045	0.130
Volatility$_t$	0.022	0.008	0.016	0.021	0.027
Non-bank liability$_t$	0.242	0.153	0.137	0.207	0.307
SOE dum$_t$	0.724	0.446	0	1	1
State ownership$_t$	0.386	0.236	0.206	0.423	0.581
Default at t	0.124	0.329	0	0	0
Default at t-1	0.023	0.152	0	0	0
Default at t+1	0.033	0.178	0	0	0

This table presents summary statistics for the sample of 9,993 nonfinancial firm-year observations. The definitions of the variables are shown in Table 1. The sample period (year t) is 1999 to 2007. All continuous variables are winsorized at the 1st and 99th percentiles of their distributions.

Table 3 Correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 Investment$_{t+1}$	1.00																	
2 Leverage$_t$	-0.09***	1.00																
3 Collateral dum$_t$	-0.13***	0.28***	1.00															
4 Collateral ratio$_t$	-0.12***	0.07***	0.57***	1.00														
5 Maturity$_t$	-0.21***	-0.07***	0.03*	-0.06***	1.00													
6 Tobin's Q_t	0.02*	-0.05***	-0.06***	0.04***	0.10***	1.00												
7 Cash flow$_{t+1}$	0.05***	-0.05***	-0.10***	-0.08***	-0.12***	-0.01	1.00											
8 Size$_t$	0.13***	0.01	-0.03***	-0.18***	-0.29***	-0.42***	0.14***	1.00										
9 Altman's Z-score$_t$	0.05***	-0.25***	-0.08***	-0.11***	0.08***	-0.06***	0.14***	0.18***	1.00									
10 Tangibility$_t$	0.31***	0.14***	-0.06***	-0.01	-0.32***	-0.13***	0.28***	0.18***	-0.09***	1.00								
11 Age$_t$	-0.20***	0.16***	0.15***	0.15***	0.06***	-0.04***	-0.02**	0.13***	0.07***	-0.08***	1.00							
12 Stock return$_t$	0.07***	-0.01	-0.02**	0.00	-0.03***	-0.03***	0.12***	0.03***	0.03***	0.01	0.03**	1.00						
13 Volatility$_t$	-0.11***	0.15***	0.16***	0.18***	0.07***	-0.01	-0.03***	-0.05***	0.06***	-0.04***	0.36***	0.25***	1.00					
14 Non-bank liability$_t$	-0.19***	0.03**	0.07***	0.06***	0.12***	0.08***	-0.06***	0.00	0.27***	-0.22***	0.23***	0.05***	0.25***	1.00				
15 State ownership$_t$	0.09***	-0.14***	-0.21***	-0.21***	-0.12***	-0.06***	0.09***	0.20***	0.09***	0.16***	-0.21***	0.00	-0.18***	-0.08***	1.00			
16 SOE dum$_t$	0.03***	-0.08***	-0.14***	-0.17***	-0.12***	-0.10***	0.05***	0.20***	0.07***	0.15***	-0.04***	0.01	-0.14***	-0.05***	0.76***	1.00		
17 Default at t	-0.18***	0.30***	0.15***	0.13***	0.09***	0.11***	-0.07***	-0.19***	-0.18***	-0.04***	0.13***	0.01	0.13***	0.25***	-0.11***	-0.06***	1.00	
18 Default at t-1	-0.03***	0.04***	0.04***	0.05***	0.01	0.03**	-0.03***	-0.06***	-0.03***	-0.03***	0.07***	-0.00	0.01	0.06***	-0.04***	-0.02*	-0.06***	1.00
19 Default at t+1	-0.08***	0.10***	0.06***	0.03***	0.05***	0.01	-0.09***	-0.06***	-0.07***	-0.03***	0.01	-0.01	0.03**	0.01	-0.06***	-0.04***	-0.07***	0.09***

This table presents Pearson correlations between two variables. The definitions of the variables are shown in Table 1. ***, **, * correspond to p-values of 1%, 5%, and 10%, respectively.

Table 4 Panel Regression of Investment on Leverage and Collateral

	(1)	(2)	(3)	(4)	(5)
Leverage$_{i,t}$	-0.109***	-0.089***	-0.097***	-0.088***	-0.091***
	(-15.94)	(-8.09)	(-11.28)	(-4.52)	(-4.93)
Collateral dum$_{i,t}$		-0.001		-0.002	
		(-0.37)		(-0.62)	
Leverage$_{i,t}$×Collateral dum$_{i,t}$		-0.022*		-0.020*	
		(-1.89)		(-1.69)	
Collateral ratio$_{i,t}$			-0.001		-0.003
			(-0.21)		(-0.55)
Leverage$_{i,t}$×Collateral ratio$_{i,t}$			-0.047***		-0.046**
			(-2.54)		(-2.47)
Tobin's $Q_{i,t}$	0.007***	0.007***	0.007***	0.007***	0.008***
	(9.71)	(9.46)	(9.78)	(10.19)	(10.52)
Cash flow$_{i,t+1}$	0.106***	0.105***	0.107***	0.105***	0.106***
	(12.50)	(12.47)	(12.61)	(12.42)	(12.58)
Maturity$_{i,t}$				-0.010*	-0.011*
				(-1.86)	(-1.95)
Leverage$_{i,t}$×Maturity$_{i,t}$				-0.007	-0.011
				(-0.38)	(-0.58)
Non bank liability$_{i,t}$				-0.037***	-0.036***
				(-5.08)	(-4.98)
Constant	0.077***	0.077***	0.076***	0.091***	0.091***
	(22.07)	(19.13)	(20.56)	(14.18)	(14.39)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
N	9993	9993	9993	9993	9993
R^2(within)	0.069	0.071	0.071	0.075	0.076

The dependent variable is *Investment*$_{t+1.}$ All models contain firm-fixed effects and year-fixed effects. The *t*-statistics in parentheses are heteroskedasticity-robust and clustered by firm. Variable definitions appear in Table 1. ***, **, * correspond to p-values of 1%, 5%, and 10%, respectively.

Table 5 Panel Regression of Investment on Leverage and Collateral: Robustness tests

	Panel A Control financial conditions		Panel B Excluding distressed firms		Panel C SOE Sample		Panel D Fama-MacBeth estimation	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Leverage$_{i,t}$	-0.032	-0.031	0.041	0.049	-0.048**	-0.050**	0.034*	0.042**
	(-1.62)	(-1.61)	(1.32)	(1.52)	(-2.04)	(-2.23)	(1.94)	(2.65)
Collateral dum$_{i,t}$	0.001		0.003		0.004		0.001	
	(0.16)		(0.67)		(0.94)		(0.45)	
Leverage$_{i,t}$×Collateral dum$_{i,t}$	-0.022*		-0.039**		-0.027*		-0.027***	
	(-1.90)		(-1.97)		(-1.92)		(-3.25)	
Collateral ratio$_{i,t}$		-0.001		0.008		0.001		-0.002
		(-0.26)		(0.97)		(0.22)		(-0.39)
Leverage$_{i,t}$×Collateral ratio$_{i,t}$		-0.055***		-0.108***		-0.055**		-0.077***
		(-3.02)		(-3.25)		(-2.36)		(-9.08)
Tobin's $Q_{i,t}$	0.006***	0.006***	0.008***	0.008***	0.008***	0.008***	0.007***	0.006***
	(8.02)	(8.07)	(5.91)	(5.95)	(8.23)	(8.28)	(4.61)	(4.58)
Cash flow$_{i,t+1}$	0.093***	0.094***	0.109***	0.110***	0.105***	0.105***	0.153***	0.152***
	(10.99)	(11.10)	(7.53)	(7.62)	(10.07)	(10.07)	(17.93)	(18.46)
Maturity$_{i,t}$	-0.008	-0.008	0.003	0.004	-0.011*	-0.011*	-0.016**	-0.016**
	(-1.36)	(-1.41)	(0.41)	(0.47)	(-1.75)	(-1.78)	(-2.69)	(-2.93)
Leverage$_{i,t}$×Maturity$_{i,t}$	-0.040**	-0.046**	-0.119***	-0.132***	-0.023	-0.029	-0.043*	-0.056**
	(-1.97)	(-2.29)	(-3.61)	(-3.99)***	(-0.98)	(-1.18)	(-2.19)	(-3.01)
Non bank liability$_{i,t}$	-0.045***	-0.044***	-0.049***	-0.049***	-0.050***	-0.050***	-0.059***	-0.058***

	(-6.22)	(-6.16)	(-2.75)	(-2.77)	(-5.23)	(-5.20)	(-18.89)	(-17.72)
Size$_{i,t}$	-0.015***	-0.016***	-0.014***	-0.016***	-0.007**	-0.008***	0.003	0.001
	(-6.67)	(-7.31)	(-3.42)	(-3.72)	(-2.51)	(-2.95)	(1.19)	(0.46)
Altman's Z-score$_{i,t}$	0.018***	0.018***	0.011*	0.009*	0.017***	0.016***	0.011***	0.010***
	(5.63)	(5.44)	(1.87)	(1.66)	(4.47)	(4.30)	(5.33)	(4.67)
Tangibility$_{i,t}$	-0.055***	-0.055***	-0.084***	-0.084***	-0.061***	-0.060***	0.074***	0.076***
	(-7.26)	(-7.28)	(-6.40)	(-6.40)	(-6.30)	(-6.26)	(7.63)	(7.85)
Age$_{i,t}$	-0.001	-0.001	-0.000	0.000	0.001	0.001	-0.005***	-0.005***
	(-0.10)	(-0.08)	(-0.01)	(0.03)	(0.08)	(0.12)	(-10.90)	(-10.01)
Stock return$_{i,t}$	0.008***	0.009***	0.007***	0.007***	0.008***	0.009***	0.022***	0.022***
	(5.92)	(6.05)	(3.00)	(3.11)	(4.75)	(4.86)	(4.37)	(4.44)
Volatility$_{i,t}$	-0.588***	-0.599***	0.087	0.067	-0.403**	-0.429**	-1.259***	-1.236***
	(-3.60)	(-3.67)	(0.32)	(0.25)	(-2.03)	(-2.17)	(-3.64)	(-3.79)
Constant	0.425***	0.455***	0.419***	0.446***	0.248***	0.275***	0.046	0.082
	(7.05)	(7.55)	(4.33)	(4.60)	(3.51)	(3.88)	(0.80)	(1.43)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes		
Number of observations	9993	9993	5415	5415	7239	7239	9993	9993
R^2(within)	0.093	0.094	0.079	0.081	0.084	0.085	0.245#	0.251#

The dependent variable is *Investment* $_{t+1}$. All models in Panel A-C contain firm-fixed effects and year-fixed effects. The *t*-statistics in parentheses are heteroskedasticity-robust and clustered by firm. In Panel A, six additional financial condition indicators are controlled. In Panel B, distress firms are excluded. Specifically, we at first delete firms that have non-zero overdue bank debt in the sample period (i.e., the remaining firms have nerver been in default over 1999-2007). We further delete the firm-year observations with negative net income or operating cash flows (i.e., both net income and operating cash flow of the remaining observations are positive). Finally, we get 5,415 non-distressed firm-year observations. In Panel C, we present regression results

for State-owned enterprises. In panel D, we present Fama and MacBeth (1973) results by running the by-year regressions and making statistical inferences according to the distribution of yearly regression coefficients. The variables are defined in Table 1. ***, **, * correspond to p-values of 1%, 5%, and 10%, respectively.

Table 6 Investment Regressions by Investment opportunities and/or Free Cash Flows (FCF)

	Panel A by investment opportunities				Panel B by free cash flow				Panel C By investment opportunities and free cash flow			
	Low Q		High Q		High FCF		Low FCF		Low Q and High FCF		High Q and Low FCF	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Leverage$_{i,t}$	-0.081***	-0.074***	-0.035	-0.033	-0.033	-0.032	-0.007	0.007	-0.093*	-0.096**	-0.001	0.022
	(-2.93)	(-2.83)	(-1.05)	(-1.02)	(-1.02)	(-1.02)	(-0.24)	(0.25)	(-1.93)	(-2.11)	(-0.01)	(0.51)
Collateral dum$_{i,t}$	0.014***		-0.006		0.005		-0.009**		0.017**		-0.018***	
	(2.84)		(-1.22)		(0.97)		(-2.25)		(2.03)		(-2.82)	
Leverage$_{i,t}$×Collateral dum$_{i,t}$	-0.045***		-0.009		-0.037*		0.012		-0.076***		0.018	
	(-2.61)		(-0.49)		(-1.86)		(0.78)		(-2.63)		(0.83)	
Collateral ratio$_{i,t}$		0.014*		-0.005		0.007		-0.010		0.028**		-0.011
		(1.72)		(-0.73)		(0.65)		(-1.54)		(2.06)		(-1.08)
Leverage$_{i,t}$×Collateral ratio$_{i,t}$		-0.124***		-0.035		-0.085***		-0.013		-0.196***		-0.032
		(-4.48)		(-1.24)		(-2.70)		(-0.56)		(-4.04)		(-0.86)
Maturity$_{i,t}$	-0.016**	-0.017**	0.003	0.003	-0.001	-0.001	-0.011	-0.011	-0.024*	-0.024*	0.002	0.004
	(-1.96)	(-1.99)	(0.40)	(0.37)	(-0.12)	(-0.07)	(-1.43)	(-1.42)	(-1.73)	(-1.72)	(0.22)	(0.36)
Leverage$_{i,t}$×Maturity$_{i,t}$	-0.018	-0.026	-0.040	-0.044	-0.051	-0.059*	-0.070**	-0.076***	-0.001	-0.010	-0.089**	-0.098**
	(-0.60)	(-0.89)	(-1.24)	(-1.36)	(-1.53)	(-1.78)	(-2.56)	(-2.76)	(-0.01)	(-0.19)	(-2.00)	(-2.21)
Tobin's $Q_{i,t}$	0.016***	0.016***	0.005***	0.005***	0.007***	0.007***	0.006***	0.006***	0.019***	0.018***	0.005***	0.005***
	(5.54)	(5.48)	(4.20)	(4.27)	(5.00)	(5.04)	(5.68)	(5.74)	(3.85)	(3.63)	(3.51)	(3.54)
Cash flow$_{i,t+1}$	0.093***	0.095***	0.092***	0.093***	0.187***	0.187***	0.026	0.027*	0.165***	0.172***	0.040*	0.044*
	(7.89)	(8.08)	(7.19)	(7.25)	(9.41)	(9.43)	(1.62)	(1.67)	(5.55)	(5.81)	(1.68)	(1.82)
Size$_{i,t}$	-0.016***	-0.016***	-0.010***	-0.012***	-0.014***	-0.015***	-0.014***	-0.015***	-0.009	-0.010	-0.006	-0.008*
	(-4.12)	(-4.33)	(-2.70)	(-3.17)	(-3.55)	(-3.83)	(-4.69)	(-5.23)	(-1.35)	(-1.50)	(-1.10)	(-1.65)
Altman's Z-score$_{i,t}$	0.016***	0.015***	0.021***	0.020***	0.015***	0.014**	0.015***	0.015***	0.009	0.007	0.009	0.008
	(3.40)	(3.15)	(4.02)	(3.99)	(2.75)	(2.60)	(3.37)	(3.31)	(1.21)	(0.97)	(1.27)	(1.16)
Tangibility$_{i,t}$	-0.047***	-0.047***	-0.065***	-0.065***	-0.073***	-0.073***	-0.045***	-0.044***	-0.073***	-0.072***	-0.051***	-0.051***
	(-4.08)	(-4.09)	(-5.58)	(-5.56)	(-5.53)	(-5.60)	(-4.46)	(-4.48)	(-3.58)	(-3.54)	(-3.20)	(-3.19)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$Age_{i,t}$	0.001	0.001	0.001	0.001*	-0.031**	-0.031**	0.000	0.001	0.002	0.002*	0.001	0.001
	(0.79)	(1.40)	(1.44)	(1.74)	(-2.07)	(-2.01)	(0.58)	(0.97)	(1.34)	(1.79)	(0.82)	(1.08)
Stock return$_{i,t}$	0.008***	0.008	0.014***	0.014***	0.007***	0.007***	0.008***	0.008***	0.006*	0.006*	0.014***	0.014***
	(3.77)	(3.95)***	(6.37)	(6.42)	(3.04)	(3.12)	(4.21)	(4.26)	(1.71)	(1.83)	(4.90)	(4.92)
Volatility$_{i,t}$	-0.705***	-0.729***	-0.525**	-0.551**	-0.821***	-0.825**	-0.791***	-0.786***	-0.778*	-0.844**	-0.716***	-0.754**
	(-2.88)	(-2.98)	(-2.18)	(-2.29)	(-2.98)	(-3.00)	(-3.65)	(-3.63)	(-1.85)	(-2.01)	(-2.23)	(-2.36)
Non bank liability$_{i,t}$	-0.077***	-0.076***	-0.044***	-0.044***	-0.052***	-0.052***	-0.050***	-0.050***	-0.097***	-0.099***	-0.051***	-0.050***
	(-5.65)	(-5.54)	(-4.27)	(-4.23)	(-3.78)	(-3.78)	(-5.74)	(-5.68)	(-3.80)	(-3.89)	(-3.98)	(-3.85)
Constant	0.439***	0.459***	0.299***	0.333***	0.505***	0.528***	0.397***	0.425***	0.316**	0.337**	0.228**	0.276***
	(5.47)	(5.70)	(3.93)	(4.36)	(5.14)	(5.37)	(6.33)	(6.77)	(2.24)	(2.40)	(2.19)	(2.64)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	5042	5042	4951	4951	4951	4951	5042	5042	2504	2504	2504	2504
R^2(within)	0.110	0.115	0.085	0.086	0.105	0.107	0.095	0.093	0.113	0.120	0.105	0.102

The dependent variable is *Investment* $_{t+1.}$ All models contain firm-fixed effects and year-fixed effects. The *t*-statistics in parentheses are heteroskedasticity-robust and clustered by firm. In this table, we investigate the impact of collateral on the association between leverage and investment depends on how likely a firm is to face overinvestment problems. In panel A, we split the sample into two groups according to investment opportunities. If a firm-year's Tobin's Q is greater than the industry median in that year, the observation will be regard as High Q, and Low Q otherwise. In Panel B, we split the sample into two groups according to free cash flow (FCF). We measure FCF as cash flow from operations minus cash dividends and scaled by lagged total assets. If a firm-year's FCF is greater than the industry median in that year, the observation will be regard as High FCF, and Low FCF otherwise. In panel C, we combine the investment opportunities and free cash flow to split the sample. The variables are defined in Table 1. ***, **, * correspond to p-values of 1%, 5%, and 10%, respectively.

Table 7 Determinants of collateral

	Panel A DEP=*Collateral dum* Rand effect Probit estimates		Panel B DEP=*Collateral ratio* Random-effect Tobit estimates	
	(1)	(2)	(3)	(4)
Default at t	0.469***	0.463***	0.091***	0.090***
	(5.11)	(5.05)	(6.79)	(6.73)
	[0.101]	[0.100]	[0.062]	[0.061]
Default at t-1	0.258*	0.259*	0.067***	0.067***
	(1.86)	(1.87)	(3.31)	(3.15)
	[0.059]	[0.059]	[0.045]	[0.044]
Default at t+1	0.380***	0.373***	0.060***	0.058***
	(3.06)	(3.01)	(3.42)	(3.31)
	[0.082]	[0.080]	[0.041]	[0.039]
Leverage$_{i,t}$	3.051***	3.008***	0.006	0.000
	(15.86)	(15.68)	(0.19)	(0.01)
	[0.787]	[0.775]	[0.004]	[0.000]
Maturity $_{i,t}$	-0.024	-0.018	-0.166***	-0.164***
	(-0.27)	(-0.21)	(-10.14)	(-10.05)
	[-0.006]	[-0.005]	[-0.108]	[-0.107]
Tobin's $Q_{i,t}$	-0.117***	-0.109***	-0.008**	-0.007**
	(-6.01)	(-5.62)	(-2.50)	(-2.15)
	[-0.030]	[-0.028]	[-0.006]	[-0.005]
Cash flow$_{i,t}$	-0.269	-0.254	-0.043	-0.044
	(-0.98)	(-0.93)	(-0.95)	(-0.96)
	[-0.069]	[-0.065]	[-0.028]	[-0.029]
Size$_{i,t}$	0.061	0.071*	-0.057***	-0.056***
	(1.53)	(1.80)	(-7.75)	(-7.63)
	[0.016]	[0.018]	[-0.037]	[-0.037]
Altman's Z-score$_{i,t}$	-0.175**	-0.168**	-0.069***	-0.067***
	(2.52)	(-2.43)	(-5.42)	(-5.30)
	[-0.045]	[-0.043]	[-0.045]	[-0.044]
Tangibility$_{i,t}$	-0.510***	-0.469***	-0.020	-0.014
	(-3.09)	(-2.85)	(-0.67)	(-0.50)
	[-0.132]	[-0.121]	[-0.013]	[-0.009]
Age$_{i,t}$	0.041***	0.024**	0.014***	0.010***
	(3.56)	(2.08)	(5.80)	(4.39)
	[0.011]	[0.006]	[0.009]	[0.007]
Stock return$_{i,t}$	-0.115***	-0.112***	-0.007	-0.006
	(-2.90)	(-2.84)	(-1.10)	(-1.00)
	[-0.030]	[-0.029]	[-0.005]	[-0.004]
Volatility$_{i,t}$	12.121***	11.534**	0.838	0.703
	(2.63)	(2.50)	(1.15)	(0.96)
	[3.126]	[2.971]	[0.547]	[0.460]
Non bank liability$_{i,t}$	0.032	0.046	-0.007	-0.004

	(0.17)	(0.24)	(-0.24)	(-0.15)
	[0.008]	[0.011]	[-0.005]	[-0.003]
SOE dummy$_{i,t}$	-0.419***		-0.075***	
	(-5.79)		(-6.11)	
	[-0.099]		[-0.050]	
State ownership$_{i,t}$		-1.108***		-0.207***
		(-7.67)		(-7.93)
		[-0.286]		[-0.135]
Constant	-0.932	-0.953	1.479***	1.494***
	(-1.08)	(-1.11)	(9.25)	(9.39)
Year fixed effects	Yes	Yes	Yes	Yes
Obs	9993	9993	9993	9993
Wald chi2	791.86***	810.37***	1006.87***	1032.51***

In Panel A, we reports rand-effect Probit regression for *Collatetal dum$_t$.* z-value, corrected for heteroskedasticity and clustered by firm, are in parentheses. In brackets, we report the marginal effect (the change in probability of *collateral dum* for each one of the independent variables.) Panel B reports rand-effect Tobit regression for *Collateral ratio$_t$* that are left-censored at zero and right-censored at one. *z*-value, corrected for heteroskedasticity and clustered by firm, are in parentheses. We also report the marginal effect in brackets. The variables are defined in Table 1. ***, **, * correspond to p-values of 1%, 5%, and 10%, respectively.