Credit Stimulus, Executive Ownership, and Firm Leverage*

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Abstract

We analyze how corporate executive ownership affects the demand for credit in response to a credit stimulus. We show that executive ownership is a significant driver of the demand for credit following credit expansion policies. Our focus on credit demand is in contrast to most studies that have focused on credit supply factors such as bank-capital. Our identification exploits the large and unexpected Chinese credit expansion in 2008. This setting offers a unique advantage as in 2008 the Chinese government had almost complete control over the banking sector and it directed the banks to increase credit supply. Thus, in this setting, demand, rather than supply, largely drives the observed changes in firms' borrowing. We provide extensive robustness tests to validate our results.

Keywords: China, Credit Policies, Executive Ownership, Leverage.

JEL Classification: E44, G28, G30, G32, G34

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1 Introduction

The Great Recession of 2008 triggered an extraordinarily large and rapid response by monetary authorities world-wide.[1] A key feature of these policies is to provide banks with additional funds at a reduced cost. Agarwal et al. (2018) discuss this stimulus policy and note that "One goal was to encourage banks to expand credit to households and firms that would, in turn, increase their borrowing, spending, and investment.. . . (pp.130)". Most of the literature examining the effectiveness of credit policies has focused on the "supply" side frictions that reduce banks' willingness to lend. For example, Bebchuk and Goldstein (2011) develop a model in which the banks abstain from lending to firms even when the firms have good projects. Gambacorta and Shin (2016) provide a recent survey of this literature, which is usually known as the "bank lending channel". They argue that poorly capitalized banks have lower loan growth.

Our paper takes a different approach. We study the demand side of credit policies, which is a relatively unexplored research area. Agarwal et al. (2018) show that consumers' propensity to borrow is key in explaining how much additional credit the economy generates. Their focus is exclusively on household's credit demand. In this paper, we focus on how corporate borrowers react to a government-initiated credit expansion. We provide evidence that the structure of executive compensation is an important determinant of the transmission of credit policies. In this regard, our results complement the growing literature that links compensation policies and risk-taking (Edmans and Gabaix 2016 provide an excellent survey of the literature).

We examine the evolution of borrowings by Chinese public-listed firms after the announcement of a remarkably large credit stimulus by the government of China in November 2008. For example, The Economist (2008) described it as "eye-popping" and reported that it "... would surely represent the biggest two-year stimulus (outside wartime) by any government in history."[2]

[1] For example, Fed Chairman Ben Bernanke explained in 2008 that "... we have eased monetary policy substantially and pro-actively to address the sharp deterioration in financial conditions and to forestall some of the potential adverse effects on the broader economy" (Bernanke 2008).

[2] Total loan quotas, which are the lending targets that Chinese bank officials are expected to meet, were increased from $4.9 trillion CNY in 2008 to almost $10 trillion CNY in 2009 (Cong et al. 2018). At the same time, the Central Bank dramatically lowered banks' reserve requirements and expanded the money supply.

The 2008 Chinese stimulus provides an interesting natural experiment. It was exceptionally large and unanticipated (Naughton 2009 and Deng et al. 2015). Importantly, for the period that we study, 2008-09, the "supply" side problem of credit expansion studied in the bank lending channel literature is not a major factor in China. This is because pre-stimulus state-controlled banks originated most of the credit in the economy and these banks reacted strongly to the stimulus. As Deng et al. (2015) state bluntly: "Beijing ordered banks to lend and they lent". Thus, for our period of analysis the key element to consider is credit demand.

Our core result is that, following the 2008 credit push, firms whose executives own a larger fraction of the firm-equity (i.e., stronger pay-for-performance incentives), increase leverage significantly more compared to firms with lower managerial ownership.[3] On average, one standard deviation increase in managerial ownership is associated with three percent higher leverage. Thus, we show that the structure of executive compensation has a significant influence on how firms react to the credit stimulus.

The baseline empirical approach we adopt is a difference-in-difference (DiD) specification. We compare the pre- versus post- stimulus time periods (first difference) exploiting cross-sectional differences in the executive ownership (second difference) at the time when the credit stimulus is announced. The first difference is plausibly exogenous; the government's credit push was largely unexpected and there is no reason to believe that firms with higher managerial ownership played any role in inducing the government to launch the credit expansion. However, the second source of variation may not be exogenous. Managerial ownership of firms is likely not allocated randomly. Thus, the same factors that drive managerial ownership may also drive the response to credit stimulus. We conduct a number of tests to address this issue.

First, we conduct a parallel trends analysis. We show that the leverage ratios of high as well as low managerial ownership firms follow a similar trend in the pre-stimulus period. However, in the post-stimulus period the executives of firms with higher ownership increase their leverage

[3]The fraction of total equity owned by the executives is commonly employed in studies of managerial ownership. For example, Panousi and Papanikolau (2012) use this measure with U.S. data to show that the negative effect of idiosyncratic risk on investment is stronger when risk-averse executives hold a higher fraction of the firm's equity.

ratios dramatically.

Second, we include firm, industry and industry-year fixed effects. Additionally, we also control for other factors that may drive the cross-sectional differences in leverage. These include whether the firm is a state-owned-enterprise, return-on-assets, book-to-market ratios, firm's size, the concentration of the ownership structure, the institutional ownership and the share of fixed assets in the total assets of the firm.

Third, we employ a propensity score matching (PSM) methodology. We designate the firms in top quartile of managerial ownership as "treatment" group. We match each of these treated firms with another firm that was predicted to have a similar level of managerial ownership but in fact did not. This matched set of firms is the "control" group. Again, we find that holding all else constant at the sample means, the top quartile firms increase their leverage significantly more.

Fourth, we re-estimate our results by excluding all state owned enterprises (SOEs) as the credit stimulus could have had a disproportionately large impact on these firms (Deng et al. 2015). Again our results continue to hold.

Fifth, we conduct a placebo test in which we randomly designate 2011 as the year of credit stimulus. In the following year (i.e. 2012) we find there is no effect of executive ownership on changes in leverage when we use this placebo year as the demarcation point. This suggests we are identifying the effects of the credit stimulus correctly.

Finally, we also employ an alternative measure of managerial pay-for-performance sensitivity by using the ratio of value of equity owned by the executives and the cash salary. This also yields similar results. Additionally when we control for prior bank-borrower relationships our results remain unchanged. Taken together, consistent findings across all of these tests strongly suggest that the structure of managerial compensation plays a significant role in how a firm reacts to a credit expansion.

Our paper links two strands of prior research studies. First, there is a growing literature that examines the interplay between a firm's pay-for-performance sensitivity of its top exec-

utives and its financial policy. Some recent examples include Cheng, Hong and Scheinkman (2015), Gopalan et al. (2014), Milidonis (2014), Panousi and Papanikolau (2012) and Shue and Townsend (2017). The second strand is the large literature that examines the role of credit supply for the efficacy of credit and monetary policies (see Ioannidou, Ongena and Peydró 2015, Dell'Ariccia, Laeven and Suarez 2016 or Gambacorta and Marques-Ibanez 2011). To our knowledge, we are the first to study how different corporate borrowers react to a credit stimulus, and to show that executive ownership plays a significant role in the post-expansion leverage choice of firms.

In addition, we also contribute to the growing literature on the Chinese corporate sector. The previous studies have focused either on the drivers of executive compensation (Firth, Fung and Rui 2006; Chen, Ezzamel and Cai 2011; and Conyon and He 2011) or on the drivers of the capital structure (Li, Yue and Zhao 2009; Firth, Lin and Wong 2008) separately. To the best of our knowledge, this is the first paper to jointly study the compensation structure and firm-leverage of Chinese corporations.

The paper proceeds as follows. Section 2 discusses the theoretical motivations that underpin our empirical tests. Section 3 describes the 2008 Chinese Credit Push and credit supply in China. Section 4 presents the empirical analysis. Section 6 summarizes our robustness tests. Section 7 concludes. The appendix describes the variables.

2 Theory

In this section we discuss why firms with higher management ownership should borrow more in response to a positive shift in the supply of credit. Absent any credit stimulus, the sign of the correlation between management ownership and leverage is ambiguous. On one side, higher variable compensation increases the exposure of the executive to the risk of firm's default. Thus, risk averse executives borrow less as they receive more variable pay.[4] However, there is also a countervailing factor that works in the opposite direction to CEO's risk aversion.

[4]Carlson and Lazrak (2010) was the first paper to show this mechanism.

For a shareholder, the firm's leverage and the CEO's effort are complements as higher variable compensation encourages the CEO to exert more effort. Thus, absent any credit stimulus, shareholders can generate a positive cross-sectional relationship between the level of leverage and variable CEO compensation to motivate their leveraged CEOs,.

The empirical studies confirm this ambiguity. For example, Bryan, Hwang, and Lilien (2000), Lewellen (2006) and Coles, Daniel and Naveen (2006) document a positive relationship between risk-taking (as proxied by firm-leverage) and pay-performance sensitivity. However, Berger, Ofek, and Yermack (1997), Mehran (1992), Wiwattanakantang (1999) report that higher pay-performance sensitivity is associated with lower firm-leverage. Thus, previous studies focusing on examining the relationship between executive incentives and firm leverage report conflicting.

Furthermore, none of these studies explicitly takes into account the impact of economy-wide credit supply shock. Ge and Gete (2018) incorporate the impact of credit supply shock in a theoretical model in which leverage, borrowing costs and compensation are all endogenous. They show that the relationship between the change in leverage and variable compensation is unambiguously positive after an expansionary shift in the credit supply. This occurs because the variable component allows the CEO to capture a larger fraction of the cash flow generated by the firm; and because the credit stimulus generates a subsidy to leverage. Since this subsidy increases the value of the borrowing firm, its CEO will borrow more if she is promised a larger share of the firm (i.e. higher variable compensation).

3 The 2008 Stimulus and Credit Supply in China

Given the size of the recession caused by the 2008 financial crisis the Chinese State Council announced a massive fiscal and monetary stimulus package on November 9, 2018. The monetary stimulus was aimed primarily at increasing the bank lending by increasing the lending quotas for banks, reducing the reserve ratio and cutting the base lending rate (Deng et al. 2015, Ouyang

and Peng 2015, and Cong et al. 2018). It was an unexpected and remarkably large shock to the credit supply that we illustrate in Figure 1, in which we plot the ratio of credit-to-GDP for several years before and after the 2008 stimulus (dotted line). As can be seen in the figure, this ratio is quite is stable at around 150% up to December of 2008. However, in 2009 the ratio shot up to almost 182%. This represents an increase of over 20% in a single year from a fairly stable baseline. The solid line plots the ratio of bank loans to GDP over the same period and shows that bulk of the growth in credit was driven largely by growth in bank loans. This ratio grows from 100% in 2008 to 122% in 2009.

Insert Figure 1 about here

Given this sharp discontinuity in 2008, for most of our empirical tests, we restrict our sample period to two years: 2008, which captures the baseline leverage and compensation structure before the credit push, and 2009, which incorporates the change in these variables subsequent to the large credit expansion. We also examined if the composition of financing sources changed significantly after the credit supply announcement. In 2008 banks account for 73% of all new loans. This ratio also remains essentially unchanged at 75.6% in 2009. Thus, at least over this two year period there is no significant change in the structure of corporate bank loan markets.

It is possible that the credit policy change was implemented differently by different banks which in turn may explain why we observe differences in borrowing by Chinese firms in response to the credit stimulus. This may lead to differences in credit supply across different banks, however this explanation is not consistent with the analysis illustrated in Figure 2. It plots the ratio of bank loans to GDP for two types of banks in China. The solid line represents that total bank loans to GDP for all banks that are directly under state control. The dashed line plots the same ratio for 16 of the largest banks that are indirectly controlled by the government. Together these two groups account for most of the bank lending in China. Comparing this ratio from end of 2008 to the end of 2009 shows that both groups increased their lending sharply and in a remarkably similar fashion. The stock of bank-loans-to-GDP ratio for the directly

controlled banks grows 20% and this number for the Top 16 indirectly controlled banks grows 25%. Thus, heterogeneity across banks is unlikely to be a major driver of variation in corporate borrowing.

Insert Figure 2 about here

Figure 3 plots the policy rate in China and the average borrowing cost for the firms in our sample of public-listed Chinese firms. The borrowing cost for an individual firm is the ratio of reported interest expenses to the total reported debt for the year. The figure shows that both the policy rate and the average borrowing costs decreased sharply after the 2008 credit push. The Online Appendix A provides a formal test of this figure.

Insert Figure 3 about here

The top graph of Figure 4 provides visual evidence that the 2008 credit stimulus led to a significant drop in borrowing costs for Chinese firms regardless of the level of leverage. This graph illustrates the cost of borrowing for the period before and after the credit push. It is a binned scatterplot. We rank order all firms according to their book leverage as reported at the end of 2008 and divide them into 20 bins of roughly 70 firms each. Thus, each bin can be viewed as an equally-weighted portfolio of firms that have similar book leverage levels. We construct a scatterplot of the average borrowing costs for each bin (y-axis) and the average book leverage (the x-axis). The solid black dots represent our calculations for 2008. The solid black line is the fitted regression for these 20 bins.

Insert Figure 4 about here

As expected, the upward sloping regression line implies that the borrowing costs are increasing in leverage. We repeat this exercise for 2009. The gray dots represent the relationship between

leverage and borrowing cost in 2009. For each of the 20 leverage ratios, the gray dots (i.e. 2009) lie below the black dots (2008). The fitted dotted line for 2009 is also below the solid line (2008) and the difference is almost one percentage point in borrowing costs across the entire leverage spectrum. The bottom graph of Figure 3 shows the same analysis but compares 2007 to 2010. Again the figure shows that pre-stimulus period had consistently higher borrowing costs compared to 2010 at every leverage level.

To sum up, the preliminary results depicted in these figures show that the China's 2008 credit push was large, it had a significant and wide-ranging impact as it was followed by large increase in borrowing and sharp decrease in borrowing costs. Furthermore, there is little evidence to suggest that these changes were driven by heterogeneity across banks as the corporate loan market shows little change in composition and almost all the increase in loans appears to be due to increase in lending by banks.

4 Empirical Analysis

4.1 Main Variables

We utilize two main sets of data: the China Stock Market & Accounting Research (CSMAR) dataset, and the Wind Financial database. CSMAR is the leading database for accounting and market information about Chinese corporations. It has been used in a number of recent research studies such as Conyon and He (2011), Giannetti, Liao and Yu (2015), Jiang and Kim (2015), Liao, Liu and Wang (2014), and Piotroski and Zhang (2014). Wind is the other major data source for Chinese firms and has been used by Li et al. (2011) and Chen et al. (2012).

Following the capital structure literature, we exclude financial firms given their significant differences in leverage and regulation relative to other industries.[5] We also restrict our sampling universe to those firms which were publicly-listed before 2008 and had a book value of equity greater than zero.

[5]See, for example, Garvey and Hanka (1999), Malmendier, Tate and Yan (2011) or Lemmon, Roberts and Zender (2008).

For the executive ownership of the firm, we create a continuous measure similar to the insider-holding variable used for U.S. based studies like Panousi and Papanikolau (2012). This measure takes the total number of shares owned by the firm's executives and divides it by the number of shares outstanding, we denote it as $Executive\,Ownership$.

Our other main variable of interest is the firm's leverage level. Following the commonly used methodology outlined in Berger, Ofek, and Yermack (1997), we measure the level of leverage at the end of the fiscal year using two continuous variables:

$$Book\,Leverage = \frac{Total\,Debt\;(Book\,Value)}{Total\,Assets\;(Book\,Value)}. \tag{1}$$

and

$$Market\,Leverage = \frac{Total\,Debt\;(Book\,Value)}{Total\,Debt\;(Book\,Value) + Equity\;(Market\,Value)}. \tag{2}$$

We estimate a number of regression models that include several control variables widely employed in other capital structure and executive compensation studies such as firm profitability, firm size and other firm level characteristics. We include detailed definitions of all of these variables in the appendix.

There is one specific firm characteristic that is unique to our sample which merits more discussion. Unlike most developed economies, a large fraction of publicly listed firms in China are state-owned enterprises (SOEs) that undertook the share issue privatization process. Many empirical studies focusing on China explicitly acknowledge this by including a control for SOEs (see for example Piotroski and Zhang 2014). We follow their approach and in all our regression tests we include a dummy variable that equals one if the firm is a SOE and zero otherwise. In our robustness tests, we re-estimate our empirical models on a subsample that excludes SOEs.

Table 1 summarizes the key variables in our sample which is a two-year (2008 and 2009) panel of publicly-listed Chinese firms. We have data on 1,530 firms. We start by reporting the leverage and compensation proxies which are at the center of our empirical analysis. The average book leverage is 0.50, implying that roughly half the book value of total assets is accounted

for by debt. For comparison, Giannetti, Liao and Yu (2015) also report an average leverage ratio of 0.5 for their sample of Chinese firms over the 1999-2009 sample period. Piotroski and Zhang (2014) report a similar level (0.52) for the sample period 2005-2007. The average market leverage ratio for our sample is 0.30, which is much lower than the book leverage. The average executive ownership in our sample is 1.85% which is similar to the middle quintile insider holding of 1.01% that Panousi and Papanikolau (2012) report for their sample of U.S. firms.

Panel C of Table 1 reports the descriptive statistics of the control variables that we use in our regressions. These are broadly consistent with existing studies of Chinese corporations (see Chen et al. 2012 and Liao, Liu and Wang 2014). SOEs makeup roughly half of our firm-year observations.

Insert Table 1 about here

4.2 DiD approach and parallel trends

Our empirical strategy examines the post-2008 *change* in leverage for firms with different levels of executive ownership. We employ a difference-in-differences (DiD) approach to isolate the impact of credit push across our two sub-groups (high versus low executive ownership firms). Angrist and Krueger (1999) note that the DiD approach is especially useful for estimating the effect of sharp changes in government policy, like our setting of Chinese credit stimulus. However, the DiD identification rests on a key assumption that absent of the policy change, the observed difference-in-differences would be zero. This assumption is frequently referred to as "parallel trend" assumption. In our setting, the parallel trends assumption requires that leverage ratio of high as well as low managerial ownership firms follow a similar trend in the pre-stimulus period. Below we discuss why we believe that the parallel trends assumption is a valid one for our sample.

Figure 5 examines this issue by plotting the leverage ratios for these two groups for several years before and after the 2008 stimulus. First, we first rank-order all firms based on

Executive Ownership as estimated at the end of 2008. We denote, all firms in which the executives own less than the median level of executive ownership as "Low Ownership" firms, while all firms above the median are denoted as "High Ownership". Next, we calculate the average book leverage for both of these groups for every year starting in 2005 to 2012. Finally, in Figure 5 we plot the evolution of the leverage ratio for these two groups over this 8-year period. The solid black line represents the leverage ratio for the low ownership group while the dashed line represents the leverage ratio of the high ownership group.

Insert Figure 5 about here

Figure 5 shows that for the four-year period leading up to 2008, the leverage ratios for both groups appear to be following a similar trend. The leverage of low executive ownership firms is always larger than that of the high executive ownership firms. However, immediately after the 2008 credit stimulus, the leverage ratio of the high ownership group increases sharply and within two years it becomes larger than that of the low ownership group. The sharp break in the leverage ratio pattern in 2008 motivates the DiD empirical strategy that we employ in the next section.

4.3 Baseline results

We estimate how the *change* in a firm's leverage after the credit expansion is related to the ownership by its executives. Our empirical strategy consists of estimating panel regression models where the dependent variable *Leverage Ratio* is either *Book Leverage* or *Market Leverage* as defined in equations (1) or (2) respectively. The benchmark model that we estimate is

$$\begin{aligned} Leverage\,Ratio_{it} = \beta_0 + \beta_1 Executive\,Ownership_{\,it} + \beta_2 Credit\,Push_t + \\ + \beta_3 Executive\,Ownership_{\,it} \times Credit\,Push_t + \\ + \sum_k \beta_k Controls_{itk} + \alpha_{ijt} + u_{it}. \end{aligned} \tag{3}$$

where i indexes firms, t indexes years, and j indexes industry. $Leverage\,Ratio_{it}$ is the leverage ratio (book or market) of the firm i at the end of year t, $Executive\,Ownership$, is the fraction of total shares owned by the top executives of a firm i at the end of year t.[6] $Credit\,Push$ is a dummy variable that equals one if the observation occurs after 2008 and zero otherwise. $Controls$ are characteristics of firm i at time t. We control for several variables commonly employed in the literature to explain leverage and compensation structure such as firm's operating performance (return-on-assets), growth opportunities (book-to-market ratio), firm's size (natural log of sales), the concentration of the ownership structure, the institutional ownership and the asset composition (ratio of fixed assets to total assets). We also include a dummy variable that equals one for firms in which the government is the largest shareholder. α_{jt} is a set of industry j and year t fixed effects. We also adjust the standard errors by clustering at the individual firm level.

The main variable of interest is the interaction term ($Executive\,Ownership \times Credit\,Push$) as it allows us to estimate how the effect of the credit push translates into leverage choices across firms with varying level of executive ownership. Specifically, we are interested in the size and significance of coefficient β_3 which captures the average change in leverage from 2008 to 2009 for varying levels of executive ownership.

Insert Table 2 about here

Table 2 describes the results of our baseline regression. Panel A reports the estimates based on $Book\,Leverage$ as the dependent variable while Panel B presents the estimation results based on $Market\,Leverage$. In column 1 of Panel A we present the results of our simplest specification where we control for the firm characteristics but do not include any fixed effects. The coefficient for $Executive\,Ownership \times Credit\,Push$ is 0.206 and it is significant at the one percent level. This implies that higher ownership by the executives is significantly more

[6]This definition is the same as the one used by Panousi and Papanikolaou (2012) who use the executive ownership as the proxy for the pay-performance sensitivity.

likely to be associated with a larger increase in debt following a government-initiated credit expansion. Thus, a one standard deviation increase in executive ownership corresponds to an increase of 0.014 in the absolute level of *Book Leverage* (0.206×0.07). Since the sample average of book leverage is 0.5, this is an economically significant increase of almost three percent. This increase in book leverage is in addition to the predicted increase of 0.061 in book leverage for *all firms* after the credit expansion (based on the coefficient of 0.0614 for $Credit\,Push$).

The coefficient for $Executive\,Ownership$ (β_1) is negative and significant at the one percent level. This result is consistent with the argument that risk-averse executives with a higher level of stock-holding will tend to choose lower levels of debt as their compensation is more exposed to the default of the firm. Huang and Song (2006) also report similar findings using data on Chinese firms from 1994 to 2003. This negative relation is also consistent with the results from other studies using U.S. data (for example, Carlson and Lazrak 2010, Morellec, Nikolov and Schurho 2012, and Glover and Levine 2015). Thus, holding all else equal, higher ownership by a firms' executives is associated with lower book leverage.

While the results in column 1 are after controlling for observable firm characteristics, there may be unobservable industry characteristics (both time-invariant and time-variant) that can bias the coefficient estimates. In columns 2 through 3 of Panel A, we re-estimate our benchmark regression specification by introducing an increasingly restrictive set of fixed effects. In column 2, we include industry fixed effects to control for any time-invariant unobserved differences across different industries. In column 3 we replace the industry fixed effects by industry-by-time fixed effects. This specification allows us to control for *time-varying* industry level unobserved heterogeneity. These specifications provide a strong control for any omitted variables bias in our estimations. Examining the coefficients for $Executive\,Ownership \times Credit\,Push$ shows that both the size and significance remains essentially unchanged when we introduce industry or industry-by-year fixed effects (columns 2 and 3).

We repeat the analysis outlined in Panel A using $Market\,Leverage$ instead of *Book Leverage* as the dependent variable in equation (3). The results are described in Panel B and closely mir-

ror the results reported in Panel A. The coefficients are, in fact, larger and the economic significance is even greater. For example, the coefficient for $Executive\,Ownership \times Credit\,Push\,(\beta_3)$ in the most restrictive specification (column 3 of Panel B) is 0.361 and significant at the one percent level. For the post-credit expansion, this implies an absolute increase of 0.025 in the market leverage for one standard deviation increase in the managerial-ownership. Since the sample mean of market leverage is 0.30, this translates into an economically large increase of over 8%. As in Panel A, the coefficient for $Executive\,Ownership$ continues to be negative and significant. The coefficient for $Credit\,Push$ is *negative*, implying a decrease in market leverage from 2008 to 2009. This finding is driven largely by the remarkable recovery of the stock prices by the end of 2009 from the extremely low levels at the end of 2008. To put this in perspective, the Shanghai composite index closed at a level of 1,821 on December 31, 2008 but had climbed to 3,277 by end of 2009, that is, an increase of 77%. Since our market leverage ratio is calculated at the end of 2008 and 2009, the huge increase in stock prices in 2009 increases the denominator in equation (2) leading to a mechanically lower level of $Market\,Leverage$ following the credit push.

The interaction term $Executive\,Ownership \times Credit\,Push\ (\beta_3)$ is significantly positive for both the book leverage ratio and the market leverage specifications. Thus, an increase in executive ownership (and the resulting increase in pay-for-performance sensitivity of compensation) for a risk-averse CEO will induce her to reduce leverage, while an increase in subsidized credit via a monetary stimulus will induce her to *increase* leverage.

Taken together, the results reported in Panel A and Panel B of Table 2 provide strong evidence that high ownership by managers is associated with lower debt levels. However, a government-sponsored credit stimulus creates significantly more incentive for managers with larger ownership to take on greater debt.

4.4 Firm fixed effects

Table 2 had industry and industry×year fixed effects. However, there may be unobservable firm characteristics (e.g. corporate culture) which may introduce omitted variable bias in our estimated coefficients. Next, we add firm fixed effects into our regression model equation (3). By using the firm fixed effect, we control for all time-invariant firm-specific characteristics, yielding coefficient estimates that are less likely to be contaminated by omitted variables bias.

Table 3 reports the results of our panel regressions that include firm fixed effects. As in the previous table, Panel A of Table 3 describes our estimation results using book leverage as the dependent variable. Column 1 reports the estimation results in which we only include firm-fixed effects (no other firm level controls). This specification assumes that any change in leverage from 2008 to 2009 for a specific firm is entirely due to managerial ownership, the credit push and the interaction of these two factors. The coefficient for $Executive\,Ownership \times Credit\,Push\,(\beta_3)$ is positive and significant at 5% level for book leverage. Thus, even for the same firm, an increase in executive-ownership implies a significantly larger increase in leverage following the credit push. In column 2 we include all the time variant firm characteristics that we had included for estimation reported in Table 2 in addition to firm fixed effects. Column 3 reports estimation of a model which also includes industry-by-year fixed effects. Both the size and the significance of the coefficient for $Executive\,Ownership \times Credit\,Push\,(\beta_3)$ remains largely unchanged.

Insert Table 3 about here

The results reported in Panel B employ market leverage as the dependent variable. The results are even stronger - the coefficient for $Executive\,Ownership \times Credit\,Push\,(\beta_3)$ is positive and significant at the one percent level. The estimated values of the β_3 are consistently above 0.20 in all specifications (columns 1 to 3).

5 Propensity Score Matching

Our results so far have examined firm's willingness to borrow based on different levels of managerial-ownership. It is possible that the difference in executive ownership across firms may itself be driven by certain firm-specific characteristics. In this section we use an alternative approach that addresses concerns that firms with high managerial ownership may differ systematically from firms with low managerial ownership. We compare the leverage choices made by high managerial ownership firms (the treatment group) to the borrowing decisions of a propensity-score-matched sample of low managerial ownership firms (the control group).

The key idea underlying the propensity score matching (PSM) methodology is to create a control group of firms who are similar to the treated firms when compared to several pre-treatment observable characteristics. For our setting, the treated firms are those with a high level of executive ownership. Ideally we would like to compare the response to credit stimulus of this group to the response of an ex-ante similar control group that did *not* have high managerial ownership. For the creation of this control group, we employ the nearest neighbor matching of propensity scores, developed by Rosenbaum and Rubin (1983). A number of recent papers, like Michaely and Roberts (2011), Dahiya, Iannotta and Navone (2017) and D'Acunto and Rossi (2017), have used this PSM methodology.

We start the matching process by creating the treatment group based on executive ownership at the end of 2008. All firms with ownership levels in the top quartile in 2008 are assigned to the high ownership (treated) group. Specifically, we create a dummy variable $Top25\,Owership$ which equals one if the firm ranks in the top 25% firms based on the executive ownership in 2008 and zero otherwise. In the second step, we estimate a probit regression model using the *Top25 Ownership* as the dependent variable and a large set of observable firm characteristics which include all firm-level control variables from the benchmark regression (3) and additional controls: CEO turnover, whether the CEO and the Chairman of the board is the same person, whether the firm has a compensation committee, the size of the board and the fraction of independent director in the board. The choice of these additional control variables for the

executive ownership is motivated by their use in prior studies of the determinant of incentive pay for the managers (Bettis and et al. 2010; Dittmann, Maug and Spalt 2010; Kato and et al 2005; Bertrand and Mullainathan 2001).

We estimate a probit model for the sample of 375 of firms classified as $Top25\,Owership$ and the remaining 1,135 firms which are not in the top quartile of managerial ownership in 2008. This allows us to estimate the predicted probability of a particular firm being in the top quartile of managerial ownership based on various firm-characteristics. In the next step, we use the predicted probabilities, (i.e. propensity scores) to match each of the high managerial ownership firms to the nearest neighbor from the control group. We employ a one-to-one match without replacement procedure. After the matching process, each firm in the treatment group (top 25% executive ownership) is paired with a firm from the control firm that has the closest propensity score. To ensure that our matching procedure creates similar firms in each pair we follow the process outlined by D'Acunto and Rossi (2017). We calculate the difference in the propensity score for each matched pair. If the propensity score difference between the matched firms is larger than one quarter of the standard deviation of the executive ownership in our sample we exclude that pair from our analysis. We also exclude all matched pairs that are not in the common support (whose propensity score is higher than the maximum or less than the minimum propensity score of the controls of our sample). After applying these exclusions we are left with a final sample of 301 treated and 301 control firms for our PSM tests.

We use the propensity score matched sample to estimate the following regression:

$$\begin{aligned} Leverage\,Ratio_{it} = \beta_0 + \beta_1 Top25\,Ownership_{i,2008} + \beta_2 Credit\,Push_t + \\ + \beta_3 Top25\,Ownership_{\,i,2008} \times Credit\,Push_t + \\ + \sum_k \beta_k Controls_{itk} + \alpha_{jt} + u_{it}, \end{aligned} \tag{4}$$

The difference-in-differences model described above is similar to the equation (3) with one modification. We use the dummy variable $Top25\ Ownership$ instead of $Executive\ Ownership$.

Again the main coefficient of interest is β_3 which is roughly the average change in leverage from pre-credit push year (2008) to the post credit push year (2009) for the treatment group (top quartile ownership) minus the same change in leverage for the control group.

Insert Table 4 about here

The results from estimating equation 4 are presented in Table 4. In the Panel A, the first column is the baseline specification that includes the firm characteristics as control variables but does not include fixed effects. The coefficient β_3 for the interaction term is 0.0231 and is significant at the one percent level. It implies that if the firm is in the top quartile of executive ownership in 2008, on average, it increases book leverage by 0.0231 more compared to a similar firm (based on observable characteristics) that was not in the top quartile of managerial ownership. It is equivalent to the around 4.6% ($0.0231 \div 0.5$) increase in book leverage for firms with top-quartile executive ownership. In columns 2 and 3 of the Panel A, we add the industry fixed effect and industry-by-year fixed effects respectively. Both the size and the significance of the coefficient β_3 remains essentially unchanged.

In the Panel B of the Table 4 we present the results using the market leverage as the dependent variable in equation 4. Column 1 (firm controls included but no fixed effects) shows that the coefficient β_3 of the interaction term $Top25\,Ownership_{i,2008} \times Credit\,Push_t$ is 0.0186 and significant at the five percent level. This is equivalent to around 6.2% ($0.0186 \div 0.3$) increase in market leverage after the credit stimulus for top quartile managerial ownership firms. This result is robust to adding the industry fixed effect (column 2) and the industry-by-year fixed effect (column 3).

The PSM results described in Table 4 support our baseline results reported earlier in tables 2 and 3.

6 Robustness tests

In this section we discuss a number of robustness tests to validate our findings.

6.1 Private firms only, excluding State Owned Enterprises

Almost half of our sample consists of State Owned Enterprises (SOE). Deng et al. (2015) argue that a significant fraction of the credit push aimed at pushing state owned banks to lend to state owned enterprises. We control for this issue by following the approach of Piotroski and Zhang (2014). We include an indicator variable for SOEs in all the estimations discussed in Section 4 (Tables 2 through 4). We classify a firm to be a SOE if the government is the largest shareholder. To ensure that our results are not sensitive to the inclusion of SOEs, we rerun our benchmark panel regression for subsamples in which we exclude all SOEs. The results are described in Table 5.

Insert Table 5 about here

The coefficient for $Executive\,Ownership \times Credit\,Push$ continues to be positive and significant for both measures of leverage. The other variables of interest continue to have coefficients that are of same sign and significance as reported in our main results of Table 2. Thus, our result that heterogeneity in managerial compensation structure is systematically related to changes in firm's leverage, continues to hold for the sample that excludes SOEs.

6.2 Using equity-to-salary ratio

Our primary measure of managerial incentives in this paper is the fraction of firm's equity owned by its executives. This measure captures the accumulated stock holding of a firm's managers. An alternative approach to measuring the executive pay-performance sensitivity is to use the ratio of the value of the stock ownership to the annual fixed cash compensation. We re-estimate our baseline specification using this alternative pay-performance sensitivity

measure, denoted as *Equity-to-Salary Ratio*. This ratio is defined as:

$$Equity\text{-}to\text{-}Salary = \frac{Market\ Value\ of\ the\ Equity \times Executive\ Ownership}{Cash\ Salary\ of\ the\ Executives}. \tag{5}$$

Where $Market\,Value\,of\,the\,Equity$ is market value of the firm at the end of the year and the $Executive\,Ownership$ is executive ownership of the firm. So, the numerator is market value of the stock held by the executives. The $Cash\,Salary\,of\,the\,Executives$ is the cash salary of the top three executives for the firms.[7]

We modify the baseline specification of equation (3) above by replacing $Executive\,Ownership$ by $Equity\text{-}to\text{-}Salary$:

$$\begin{aligned} Leverage\,Ratio_{it} = {} & \beta_0 + \beta_1 Equity\text{-}to\text{-}Salary_{it} + \beta_2 Credit\,Push_t + \\ & + \beta_3 Equity\text{-}to\text{-}Salary \times Credit\,Push_t + \\ & + \sum_k \beta_k Controls_{itk} + \alpha_{jt} + u_{it}. \end{aligned} \tag{6}$$

The results from estimation of various regression models are described in Table 6. Again we use both the book leverage (Panel A) as well as Market Leverage (Panel B) as our dependent variable. The first column of both panels shows that the firms with higher *Equity-to-Salary* ratio increased their leverage ratio significantly more in response to the credit push. The coefficient on the interaction term is positive and significant at the one percent level in both panels. Columns 2 and 3 provide estimations of expanded regressions that include industry and industry-by-year fixed effects. The size and statistical significance remain essentially unchanged. Thus, our core findings are robust to this alternative definition of pay for performance sensitivity of executives.

Insert Table 6 about here

[7]Data on executive ownership for Chinese firms is only available as an aggregate measure.

6.3 Placebo test

A possible concern about our findings is the validity of our natural experiment. Although Figure 6 shows a clear discontinuity around 2008, to establish a stronger claim for causality, we design a falsification test in which we designate 2012 as a placebo "post-credit push" year by assigning a fake credit push at the end of 2011. We rerun all our tests on the 2011 and 2012 panel data, effectively simulating a two year period around the fake credit stimulus. The results of this placebo test are presented in Table 7.

Insert Table 7 about here

Since there was no policy shift in the placebo period, we expect to see the placebo *Credit Push* period of 2012 to have no explanatory power. This is indeed what we find. For both the book leverage and the market leverage, the coefficient for *Executive Ownership*×*Placebo Credit Push* is statistically insignificant.[8]

6.4 Pre-credit push compensation

A possible concern is that firms can react rapidly by adjusting the compensation of their executives in response to the credit stimulus. This concern is unlikely to be a critical one because it pushes our tests towards not finding any significant effects. Nevertheless, we re-estimate our baseline specification in which we fix the compensation structure proxies at their 2008 values. Since these contracts were in place before the announcement of the credit push, it is reasonable to argue that they were unaffected by the policy shift announced in November of 2008. The results reported in Table 8 show that our original findings remain robust to this alternative specification.

Insert Table 8 about here

[8]The coefficient of the *Executive Ownership* however, is still negative for the placebo test. This is consistent with the theoretical predictions of negative relation between executive ownership and leverage during normal times.

6.5 Larger sample

The sample period of all of our tests has been the two year period 2008-2009. This choice was driven by our belief that the *ceteris paribus* assumption is more likely to be true over this short period. In Table 9, we re-estimate our panel regression over a longer, four year period (2007-2010). Again, for both the book leverage (Panel A) as well as the market leverage (Panel B), we find that the interaction term $Executive\,Ownership \times Credit\,Push$ has a positive and significant (at the one percent level) coefficient, similar to our main results reported in Table 2 for the 2008-2009 sample.

Insert Table 9 about here

6.6 Bank-borrower relationships

Our identification strategy implicitly assumes that supply of bank loan is not a dominant explanation for how Chinese firms responded to the credit stimulus. We discussed earlier that almost all banks in China are either directly or indirectly controlled by the government and both groups appear to have increased their lending sharply. However, there may still be heterogeneity across individual banks. There is no theoretical reason why differences in credit stimulus response across banks should lead to our main result of significant differences in borrowing by high managerial ownership versus low managerial ownership. However, to rule out any bank-specific supply factor we estimate a modified version our baseline specification (equation 3) which is decribed below:

$$\begin{aligned} Leverage\,Ratio_{it} = {} & \beta_0 + \beta_1 Executive\,Ownership_{\,it} + \beta_2 Credit\,Push_t \\ & + \beta_3 Executive\,Ownership_{\,it} \times Credit\,Push_t \\ & + \sum_k \beta_k + Controls_{itk} + \alpha_{jt} + \sum_b \beta_b Bank_{i,b} + u_{it}. \end{aligned} \tag{7}$$

The key modification is the inclusion of a number of dummy variables for each bank. Specifically we employ a separate CSMAR dataset called the CSMAR–Bank Loans of Chinese Listed

Companies (CSMAR-BLCLC) dataset which includes the details of new loans taken by Chinese corporations. All firms in China are required to make the public announcement about any development that may have a significant impact on the company's assets, liabilities, equity and operating results. These public releases can be considered similar to the form 8-K filings done by public firm in the United States. Frequently, Chinese firms include any new bank loans as part these public announcements. CSMAR uses the information from these documents to construct the bank-firm loan data. Each observation in this data is a unique bank-firm loan transaction. We merge the data on all new loans originated in 2006-2008 period with our original sample. We only retain a firm from our original sample, if we can identify it in the CSMAR-BLCLC dataset. This reduces our sample of observations from almost 3,000 to 1,256. However, this sample allows us to control for pre-existing banking relationships. Specifically, this allows us to create a dummy variable $Bank_{i,b}$ which equals one if firm i had borrowed at least once from bank b in the pre-credit push period (2006-2008) and zero otherwise. Cong et al. 2018 state that 95% of new loans to Chinese firms are originated by banks with which the borrower has a pre-existing credit relationship. Thus, by including a dummy variable that captures existing lending relationships, we will be able to control for any bank-specific heterogeneity. To keep the number of indicator variables tractable we focus on the 20 largest commercial banks and the three policy banks in China.[9] All the other remaining banks are grouped in a single category of other banks. We estimate the specification outlined in equation 7 and report the results in table 10. The coefficient for the interaction term $Executive\,Ownership_{it} \times Credit\,Push_t$ for both the book-leverage (Panel A) and market leverage (Panel B) is positive and significant at the one percent level. In fact, the estimated coefficients after controlling for prior banking relationship are very similar to those estimated for the baseline specification in equation 3 reported in table 2

Insert Table 10 about here

[9]The three policy banks are Agricultural Development Bank of China (ADBC), China Development Bank (CDB), and the Export-Import Bank of China (Chexim).

7 Conclusions

How the private sector reacts to a government-initiated credit stimulus is an important topic for economists as well as policy makers. After all, the ultimate goal for expansionary credit policies is to induce greater borrowing by households and corporations. However, when faced with increased credit supply, not all firms will respond in a similar manner. This paper focuses on one important source of heterogeneity across firms: the compensation structure of the top executives.

We study the 2008 Chinese government's exceptionally large and unanticipated credit expansion. The Chinese setting offers a unique advantage as the Chinese government has almost complete control over the banking sector. This implies that banks had little discretion in not increasing the credit supply. Thus, demand, rather than supply, largely drives the observed changes in firms' borrowing.

Our results provide empirical support for the idea that in normal economic times, debt and compensation structure (as proxied by executive ownership) are substitute mechanisms for inducing managerial effort. However, when a large, government-subsidized credit expansion is in place, the executives with higher ownership (i.e. higher pay-for-performance sensitivity) will take on more debt. We provided many tests to validate our results.

This paper can motivate future research on how credit policies may produce different responses across countries, as well as across different industries within a country. For example, it may be that the credit policies in Japan, and to a certain extent in Europe, did not lead to significantly more borrowing by the corporate sector because executives did not have enough ownership. In this regard, Gorry et al. (2017) show that the structure of executive compensation is sensitive to taxation. Our results indicate that tax incentives to encourage greater managerial equity ownership can create conditions in which firms will be more willing to increase leverage in response to a credit stimulus.

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Appendix. Definitions.

Here we describe the main variables that we use in the paper. We utilize two main datasets: the China Stock Market & Accounting Research (CSMAR) dataset, and the Wind Financial database. All the continuous variables are winsorized at the 1% and 99% level.

A. Main variables:

Book value leverage (Book Leverage) is the ratio of total debt to total assets of the firm.

Market value leverage (Market Leverage) is the ratio of total debt to the sum of market value of the firm's equity and total debt.

The percentage of executives stock-holding (Executive Ownership) is the ratio of the shares held by the executives to the total shares of the firm. The executives are the senior executives disclosed in the annual report, including the CEO, the general manager and other senior managers.

Executive equity to cash salary ratio (Equity-to-Salary) is the ratio of the market value of shares held by the executives to the annual cash compensation for executives. The detailed definition is in Section 6.2, equation (5).

Credit Push is a dummy variable equal to one if year$\geq$2009, and it is zero otherwise.

Post 2012 is a indicator for the placebo test, denoting whether $t = 2012$.

Interest Expense (%) is the firm's ratio of the interest expense to the total debt.

B. Control variables

Return-on-assets (ROA) is the ratio of operating income of the firm before taxation and interest expense to the total asset of the firm.

Market-to-book ratio (Market Book) is the ratio of the stock market value of the firm to the book value of the firm's total assets.

Asset tangibility of the firm (Asset Tangibility) is the ratio of the fixed assets to the total assets of the firm.

Positive Net Profit is an indicator to show whether the firm's annual net profit after tax and interest expense is positive.

Dividend is a dummy variable equal to one if the firm paid a dividend in that year and zero otherwise.

State-Owned-Enterprises (SOE) is a dummy variable that equals one if the firm is directly controlled by the government and zero otherwise.[10]

Size of the firm (Size) is the logarithm of the total sales of the firm.

Concentration of the share structure (Stock Holding Concentration) is the sum of squares of the percent of shares of the five largest shareholders.

Institutional percentage of share (Institution Stock Holding) is the ratio of shares held by the institutional investors to the total shares of the firm.

Holding by banks (Bank Holding) is an indicator to show whether the stock of the firm is held by Chinese commercial banks.

Holding by foreign investors (Foreign Holding) is an indicator to show whether the stock of the firm is held by foreign investors.

CEO Turnover indicator (CEO Turnover) is an indicator to show whether the firm has CEO turnover during the fiscal year.

CEO Chairman is a dummy variable that equals one if the CEO is also the chairman of the board. It is zero otherwise.

Compensation Committee is a dummy variable that equals one if the firm has a compensation committee. It is zero otherwise.

Board Size is the number of directors on the board of the firm.

Board Independence is the ratio of outside directors to the total number of directors in the board.

[10]To classify as SOEs, we follow Chen et al. (2012) and Liao, Liu and Wang (2014) and use the ultimate controller of the firms. In the robustness section, we check that alternative definitions do not alter the results.

Tables

Table 1. Summary Statistics

Variable	*# Obs*	*# Firms*	*Mean*	*Median*	*SD*	*Min*	*Max*
A. Main Variables							
Book Leverage	3007	1530	0.5	0.51	0.19	0.05	1
Market Leverage	3007	1530	0.3	0.26	0.19	0.01	0.81
Executive Ownership	3007	1530	0.02	0	0.07	0	0.63
Equity-to-Salary	2999	1529	61.43	0	275.07	0	2801.08
Interest Expense (%)	1956	1180	2.89	2.78	1.76	0.01	8.18
B. Other Control Variables							
ROA (net)	3007	1530	0.05	0.05	0.08	-0.42	0.39
Size (ln($sales$))	3007	1530	21.04	20.98	1.48	14.4	28
Market Book	3007	1530	1.79	1.36	1.52	0.14	10.8
Asset Tangibility	3007	1530	0.28	0.25	0.19	0	0.92
Dividend (Dummy)	3007	1530	0.54	1	0.5	0	1
Positive Net Profit (Dummy)	3007	1530	0.87	1	0.34	0	1
SOE	3007	1530	0.51	1	0.5	0	1
Stock Holding Concentration	3007	1530	0.18	0.15	0.12	0	0.76
Institution Ownership	3007	1530	0.07	0.03	0.1	0	0.68
Bank Holding (Dummy)	3007	1530	0.03	0	0.17	0	1
Foreign Holding (Dummy)	3007	1530	0.06	0	0.24	0	1
CEO Turnover (Dummy)	3007	1530	0.19	0	0.4	0	1
CEO Chairman (Dummy)	2921	1510	0.85	1	0.36	0	1
Compensation Committee (Dummy)	3007	1530	0.85	1	0.36	0	1
Board Size	2957	1526	9.19	9	1.89	4	18
Board Independence	2957	1526	0.36	0.33	0.05	0.09	0.71

This table reports the summary statistics of the 1,530 public-listed Chinese firms for the 2008-2009 period. The unit of observation is the firm-year. The data sources are the China Stock Market & Accounting Research (CSMAR) dataset, and the Wind Financial database. All the continuous variables are winsorized at 1% and 99% level. The variables are described in detail in the appendix.

Table 2. Executive Ownership and Firm Leverage After the Credit Push.

Panel A. Book Leverage

	(1)	(2)	(3)
Executive Ownership$_{i,t}$ × Credit Push$_t$	0.206***	0.185***	0.188***
	(0.000)	(0.000)	(0.000)
Executive Ownership$_{i,t}$	-0.222***	-0.179***	-0.180***
	(0.000)	(0.001)	(0.001)
Credit Push$_t$	0.0614***	0.0550***	0.121***
	(0.000)	(0.000)	(0.003)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	3007	3007	3007
R^2	0.354	0.391	0.393

Panel B. Market Leverage

	(1)	(2)	(3)
Executive Ownership$_{i,t}$ × Credit Push$_t$	0.361***	0.343***	0.327***
	(0.000)	(0.000)	(0.000)
Executive Ownership$_{i,t}$	-0.255***	-0.229***	-0.220***
	(0.000)	(0.000)	(0.000)
Credit Push$_t$	-0.0507***	-0.0580***	0.0382*
	(0.000)	(0.000)	(0.094)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	3007	3007	3007
R^2	0.604	0.636	0.640

This table reports the estimation of equation 3. The sample covers 2008 and 2009. We use book leverage as the dependent variable for Panel A and market leverage as the dependent variable for Panel B. The controls are return to assets, size of the firm, market-to-book ratio, assets tangibility, dividend, positive net profit, state owned enterprise, ownership concentration, institutional ownership, bank holding and foreign holding. We also include industry fixed effects and industry-by-year fixed effects. The p-values are in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level. The standard errors are clustered at the firm level. The variables are described in detail in the Appendix.

Table 3. Effect of Executive Ownership on Firm Leverage After the Credit Push: Firm Fixed Effects

Panel A. Book Leverage

	(1)	(2)	(3)
Executive Ownership$_{i,t}$ × Credit Push$_t$	0.0626**	0.0617**	0.0646**
	(0.039)	(0.042)	(0.035)
Executive Ownership$_{i,t}$	0.0262	0.0523	0.0521
	(0.751)	(0.476)	(0.477)
Credit Push$_t$	0.00984***	0.0163***	0.0201
	(0.000)	(0.000)	(0.237)
Firm's Controls	No	Yes	Yes
Industry× Year FE	No	No	Yes
Firm FE	Yes	Yes	Yes
Observations	3007	3007	3007
R^2	0.021	0.149	0.156

Panel B. Market Leverage

	(1)	(2)	(3)
Executive Ownership$_{i,t}$ × Credit Push$_t$	0.220***	0.210***	0.209***
	(0.000)	(0.000)	(0.000)
Executive Ownership$_{i,t}$	-0.130**	-0.104**	-0.0962**
	(0.011)	(0.025)	(0.046)
Credit Push$_t$	-0.128***	-0.124***	-0.0742***
	(0.000)	(0.000)	(0.000)
Firm's Controls	No	Yes	Yes
Industry× Year FE	No	No	Yes
Firm FE	Yes	Yes	Yes
Observations	3007	3007	3007
R^2	0.664	0.696	0.703

This table redoes Table 2 but adding firm fixed effects. The sample covers 2008 and 2009. The p-values are in parentheses.

Table 4. Executive Ownership and Firm Leverage After the Credit Push: Propensity Score Matching Estimation

Panel A. Book Leverage

	(1)	(2)	(3)
$\text{Top25 Ownership}_{i,2008} \times \text{Credit Push}_t$	0.0231***	0.0222***	0.0233***
	(0.006)	(0.007)	(0.005)
$\text{Top25 Ownership}_{i,2008}$	-0.0300**	-0.0313**	-0.0318**
	(0.017)	(0.011)	(0.010)
Credit Push_t	0.0498***	0.0431***	0.0714***
	(0.000)	(0.000)	(0.002)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	1204	1204	1204
R^2	0.371	0.410	0.412

Panel B. Market Leverage

	(1)	(2)	(3)
$\text{Top25 Ownership}_{i,2008} \times \text{Credit Push}_t$	0.0186**	0.0177**	0.0187**
	(0.031)	(0.035)	(0.023)
$\text{Top25 Ownership}_{i,2008}$	-0.0195*	-0.0196**	-0.0203**
	(0.055)	(0.046)	(0.040)
Credit Push_t	-0.0577***	-0.0657***	-0.0211
	(0.000)	(0.000)	(0.329)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	1204	1204	1204
R^2	0.627	0.658	0.665

This table reports the estimation of equation 4. The sample covers 2008 and 2009. It consists of 602 public-listed Chinese firms representing 301 firms with executive ownership in the top 25% (treated group), and a matched sample of 301 firms (control group) which had similar probability (i.e. propensity) of being in the top quartile of executive ownership but were not. The matched firms were chosen by the propensity score based on the 2008 values of the control variables following the nearest neighbor approach of Rosenbaum and Rubin (1983). The variables are defined in the Appendix. The significance levels are the same than in Table 2. The control variables are all the controls in Table 2 plus CEO turnover, whether the CEO and the Chairman of the board is the same person, whether the firm has a compensation committee, the size of the board and the fraction of independent director in the board. The p-values are in parentheses. The standard errors are clustered at the firm level.

Table 5. Executive Ownership and Firm Leverage After the Credit Push: Non-SOE Sample.

Panel A. Book Leverage

	(1)	(2)	(3)
Executive Ownership$_{i,t}$ × Credit Push$_t$	0.167***	0.158***	0.157***
	(0.000)	(0.001)	(0.002)
Executive Ownership$_{i,t}$	-0.224***	-0.183***	-0.182***
	(0.000)	(0.002)	(0.003)
Credit Push$_t$	0.0571***	0.0508***	0.0953**
	(0.000)	(0.000)	(0.040)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	1469	1469	1469
R^2	0.372	0.405	0.406

Panel B. Market Leverage

	(1)	(2)	(3)
Executive Ownership$_{i,t}$ × Credit Push$_t$	0.283***	0.267***	0.240***
	(0.000)	(0.000)	(0.000)
Executive Ownership$_{i,t}$	-0.266***	-0.225***	-0.209***
	(0.000)	(0.000)	(0.000)
Credit Push$_t$	-0.0492***	-0.0568***	0.0356
	(0.000)	(0.000)	(0.168)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	1469	1469	1469
R^2	0.597	0.629	0.634

This table reports the estimation of equation 3 but now the sample consists only of the public-listed Chinese firms which are not directly controlled by the Government (non-SOE firms). The sample covers 2008 and 2009. The variables are defined in the Appendix. The controls and significance levels are the same than in Table 2. The p-values are in parentheses. The standard errors are clustered at the firm level.

Table 6. Executive Ownership and Firm Leverage After the Credit Push: Equity-to-Salary Ratio as an Alternative Proxy.

Panel A. Book Leverage

	(1)	(2)	(3)
Equity-to-Salary$_{i,t}$ × Credit Push$_t$	0.0000545***	0.0000447***	0.0000446***
	(0.000)	(0.002)	(0.002)
Equity-to-Salary$_{i,t}$	-0.0000445**	-0.0000318*	-0.0000315*
	(0.012)	(0.060)	(0.066)
Credit Push$_t$	0.0632***	0.0565***	0.122***
	(0.000)	(0.000)	(0.002)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	2999	2999	2999
R^2	0.351	0.389	0.391

Panel B. Market Leverage

	(1)	(2)	(3)
Equity-to-Salary$_{i,t}$ × Credit Push$_t$	0.0000783***	0.0000706***	0.0000654***
	(0.000)	(0.000)	(0.001)
Equity-to-Salary$_{i,t}$	-0.0000568***	-0.0000489**	-0.0000445**
	(0.009)	(0.015)	(0.033)
Credit Push$_t$	-0.0482***	-0.0557***	0.0387*
	(0.000)	(0.000)	(0.092)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	2999	2999	2999
R^2	0.601	0.634	0.637

This table reports the estimation of equation 6. The sample covers 2008 and 2009. The variables are defined in the Appendix. The controls and significance levels are the same than in Table 2. The p-values are in parentheses. The standard errors are clustered at the firm level.

Table 7. Executive Ownership and Firm Leverage After the Credit Push: Placebo Test on 2011 and 2012.

Panel A. Book Leverage

	(1)	(2)	(3)
Executive Ownership$_{i,t}$ × Post2012	0.0150	0.0250	0.0309
	(0.766)	(0.602)	(0.527)
Executive Ownership$_{i,t}$	-0.156**	-0.119*	-0.122*
	(0.022)	(0.063)	(0.057)
Post2012	-0.00735**	-0.00691**	0.0783
	(0.015)	(0.021)	(0.106)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	3001	3001	3001
R^2	0.322	0.377	0.377

Panel B. Market Leverage

	(1)	(2)	(3)
Executive Ownership$_{i,t}$ × Post2012	0.00505	0.0207	0.0186
	(0.913)	(0.622)	(0.659)
Executive Ownership$_{i,t}$	-0.132**	-0.0906*	-0.0904*
	(0.028)	(0.087)	(0.084)
Post2012	-0.000562	-0.000137	0.121***
	(0.804)	(0.950)	(0.000)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	3001	3001	3001
R^2	0.590	0.657	0.657

This table reports the estimation of equation 6 but using placebo years. The sample covers 2011 and 2012. Post2012 denotes whether $t = 2012$. The variables are defined in the Appendix. The controls and significance levels are the same than in Table 2. The p-values are in parentheses. The standard errors are clustered at the firm level.

Table 8. Executive Ownership and Firm Leverage After the Credit Push: Ownership Fixed at 2008 level.

Panel A. Book Leverage

	(1)	(2)	(3)
$\text{Executive Ownership}_{i,2008} \times \text{Credit Push}_t$	0.159***	0.142***	0.143***
	(0.000)	(0.000)	(0.000)
$\text{Executive Ownership}_{i,2008}$	-0.233***	-0.189***	-0.189***
	(0.000)	(0.001)	(0.001)
Credit Push_t	0.0619***	0.0554***	0.120***
	(0.000)	(0.000)	(0.003)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	3007	3007	3007
R^2	0.355	0.392	0.393

Panel B. Market Leverage

	(1)	(2)	(3)
$\text{Executive Ownership}_{i,2008} \times \text{Credit Push}_t$	0.341***	0.326***	0.310***
	(0.000)	(0.000)	(0.000)
$\text{Executive Ownership}_{i,2008}$	-0.267***	-0.240***	-0.231***
	(0.000)	(0.000)	(0.000)
Credit Push_t	-0.0507***	-0.0580***	0.0377*
	(0.000)	(0.000)	(0.099)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	3007	3007	3007
R^2	0.604	0.636	0.639

This table reports the estimation of equation 3 but now $\text{Executive Ownership}_{i,2008}$ is fixed at the end of year 2008. The sample covers 2008 and 2009. The remaining variables are defined in the Appendix. The controls and significance levels are the same than in Table 2. We also include industry fixed effects and industry-by-year fixed effects. The p-values are in parentheses. The standard errors are clustered at the firm level.

Table 9. Executive Ownership and Firm Leverage After the Credit Push: Longer Sample Period of 2007 to 2010.

Panel A. Book Leverage

	(1)	(2)	(3)
Executive Ownership$_{i,t}$ × Credit Push$_t$	0.160***	0.145***	0.139***
	(0.000)	(0.001)	(0.001)
Executive Ownership$_{i,t}$	-0.253***	-0.207***	-0.183***
	(0.000)	(0.000)	(0.000)
Credit Push$_t$	0.00986***	0.00908***	0.0520
	(0.002)	(0.003)	(0.271)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	5898	5898	5898
R^2	0.310	0.348	0.364

Panel B. Market Leverage

	(1)	(2)	(3)
Executive Ownership$_{i,t}$ × Credit Push$_t$	0.134***	0.125***	0.137***
	(0.000)	(0.000)	(0.000)
Executive Ownership$_{i,t}$	-0.115***	-0.0899**	-0.116***
	(0.006)	(0.022)	(0.003)
Credit Push$_t$	-0.0223***	-0.0236***	0.0538*
	(0.000)	(0.000)	(0.091)
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	5898	5898	5898
R^2	0.584	0.613	0.642

This table reports the estimation of equation 3 but using a longer sample period that covers 2007-2010. The variables are defined in the Appendix. The controls and significance levels are the same than in Table 2. The p-values are in parentheses. The standard errors are clustered at the firm level.

Table 10. Executive Ownership and Firm Leverage After the Credit Push. Control for the Banks and Firms Relation

Panel A. Book Leverage

	(1)	(2)	(3)
Executive Ownership$_{i,t}$ × Credit Push$_t$	0.227***	0.219***	0.214***
	(0.003)	(0.004)	(0.006)
Executive Ownership$_{i,t}$	-0.136**	-0.115*	-0.111*
	(0.027)	(0.064)	(0.077)
Credit Push$_t$	0.0477***	0.0415***	0.0936*
	(0.000)	(0.000)	(0.066)
Prior Bank-Borrower Relationship	Yes	Yes	Yes
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	1256	1256	1256
R^2	0.398	0.429	0.430

Panel B. Market Leverage

	(1)	(2)	(3)
Executive Ownership$_{i,t}$ × Credit Push$_t$	0.322***	0.315***	0.301***
	(0.000)	(0.000)	(0.000)
Executive Ownership$_{i,t}$	-0.246***	-0.227***	-0.218***
	(0.000)	(0.000)	(0.000)
Credit Push$_t$	-0.0577***	-0.0652***	0.0187
	(0.000)	(0.000)	(0.534)
Prior Bank-Borrower Relationship	Yes	Yes	Yes
Firm's Controls	Yes	Yes	Yes
Industry FE	No	Yes	No
Industry× Year FE	No	No	Yes
Observations	1256	1256	1256
R^2	0.656	0.682	0.684

This table reports the estimation of equation 7. The sample covers 2008 and 2009. The Bank-Borrower Relationship is a indicator to show the historical relation between the firm i and bank b. This equals one if firm i had borrowed from bank b at least once during the 2006–2008 period (before the credit push) and zero otherwise. We create this variable for top 20 commercial banks, 3 policy banks and a single "Other" category for all the remaining banks. These are created using the CSMAR–Bank Loans of Chinese Listed Companies (CSMAR- BLCLC) dataset. We use book leverage as the dependent variable for Panel A and market leverage as the dependent variable for Panel B. The controls are return to assets, size of the firm, market-to-book ratio, assets tangibility, dividend, positive net profit, state owned enterprise, ownership concentration, institutional ownership, bank holding and foreign holding. We also include industry fixed effects and industry-by-year fixed effects. The p-values are in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level. The standard errors are clustered at the firm level. The variables are described in detail in the Appendix.

Figures

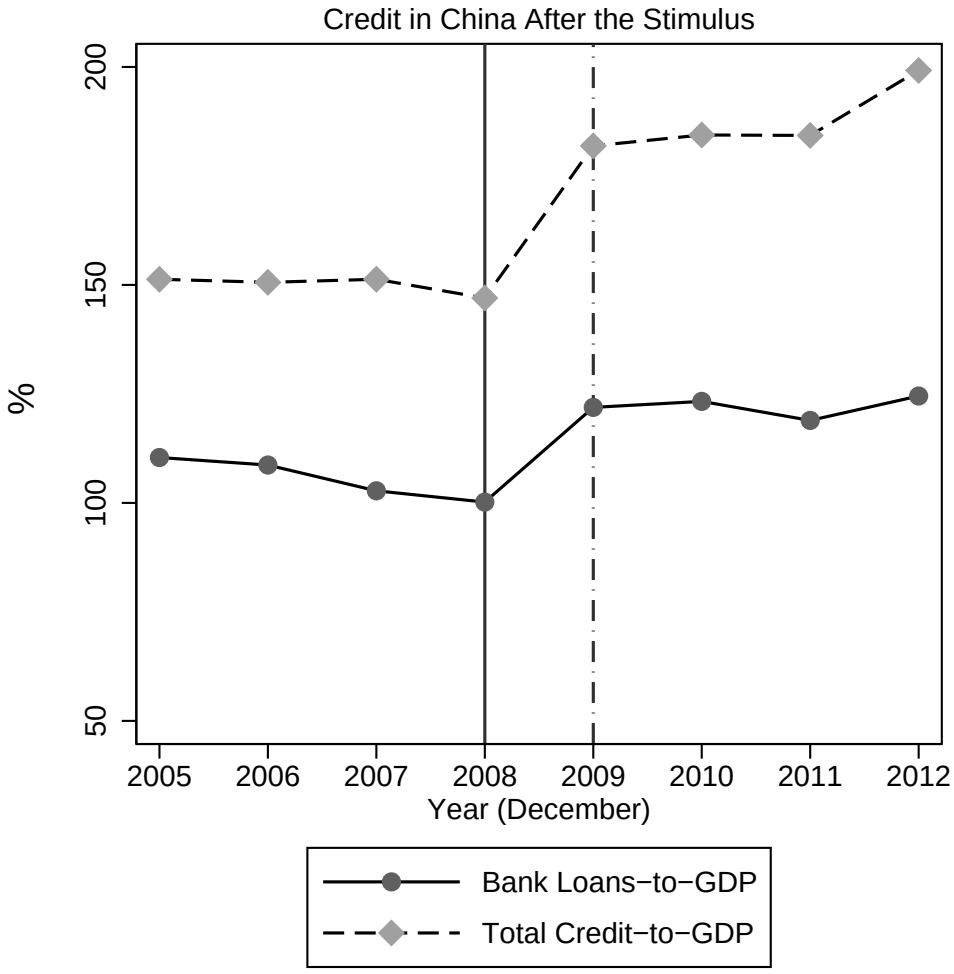

Figure 1. The credit-to-GDP ratio vs the bank loans-to-GDP ratio. The Credit-to-GDP is the ratio of the credit to GDP for the non-financial sector. The Bank Loans-to-GDP is the ratio of the aggregate bank loans to GDP. The vertical solid line is end of 2008, which is when the credit stimulus was announced by the Chinese government. The vertical dashed-line is the end of 2009, one year after the credit push. Sources: Bank for International Settlements, CSMAR database and China Banking Regulatory Commission (CBRC).

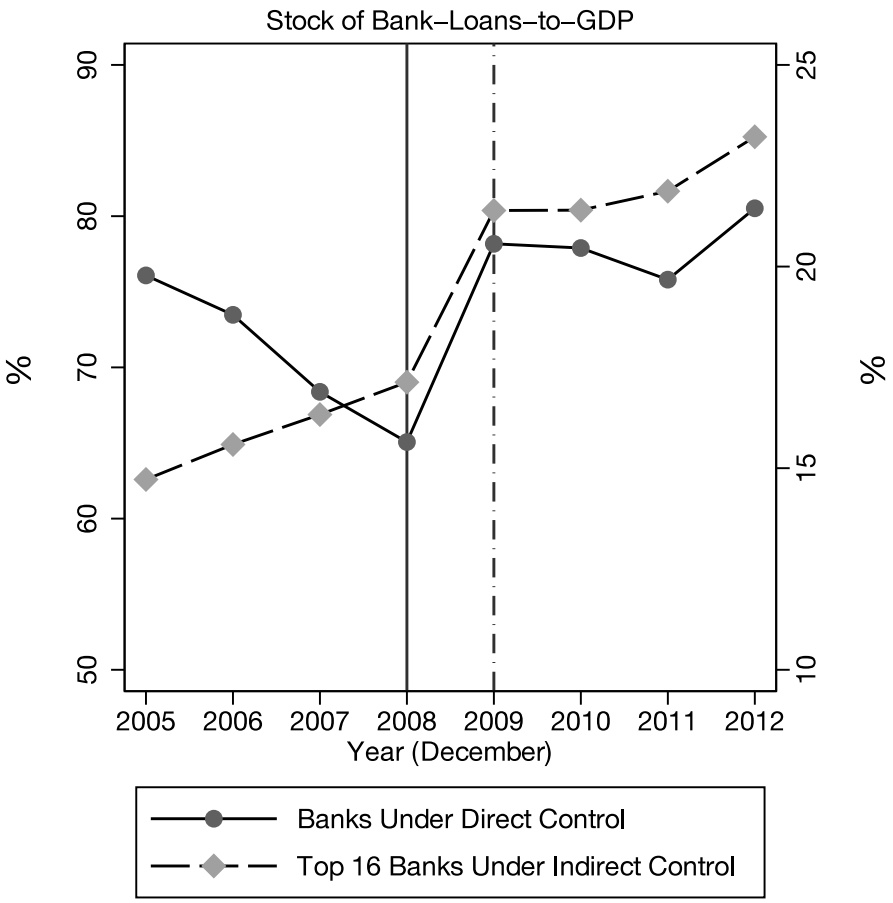

Figure 2. Bank-loans-to-GDP ratio in China for different types of banks . The vertical line is end of 2008, which is when the credit stimulus was announced by the Chinese government. The vertical dashed-line is end of 2009, one year after the credit push. 2008-09 is the sample we study in the empirical work. Banks under direct control of the government are: Industrial and Commercial Bank of China, Agricultural Bank of China, Bank of China, China Construction Bank, Bank of Communications, China Postal Savings Bank, Agricultural Development Bank of China, China Development Bank, and the Export-Import Bank of China. Banks under indirect control are the top 16 large commercial banks indirectly controlled by the government. Source: China Banking Regulatory Commission (CBRC).

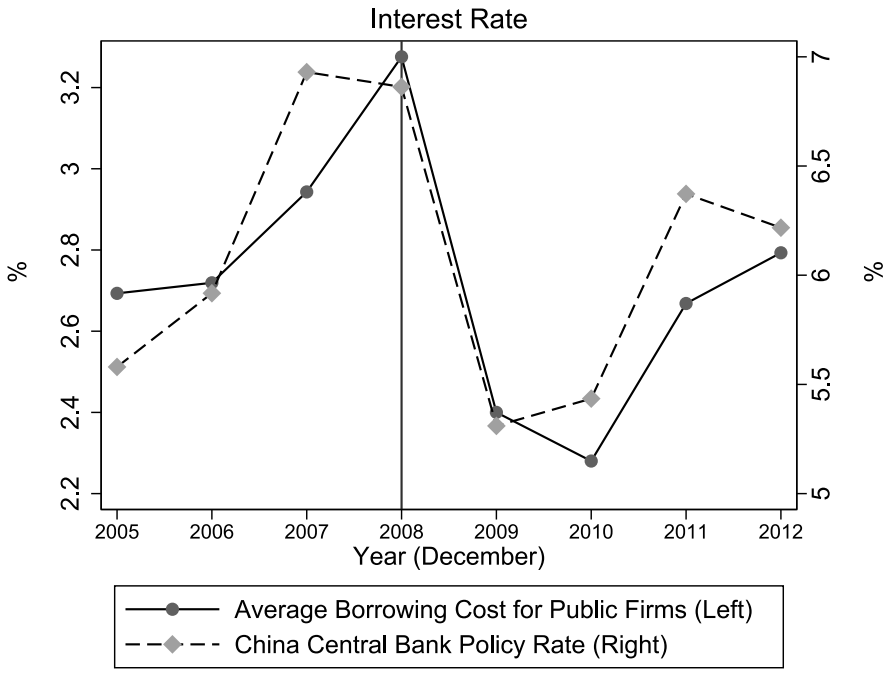

Figure 3. Cost of Borrowing in China. This figure plots the policy rate of China's Central Bank (dashed line) and the average cost of debt for the Chinese public firms (solid line). The vertical line is end of 2008, which is when the credit stimulus was announced by the Chinese government. Source: Wind database.

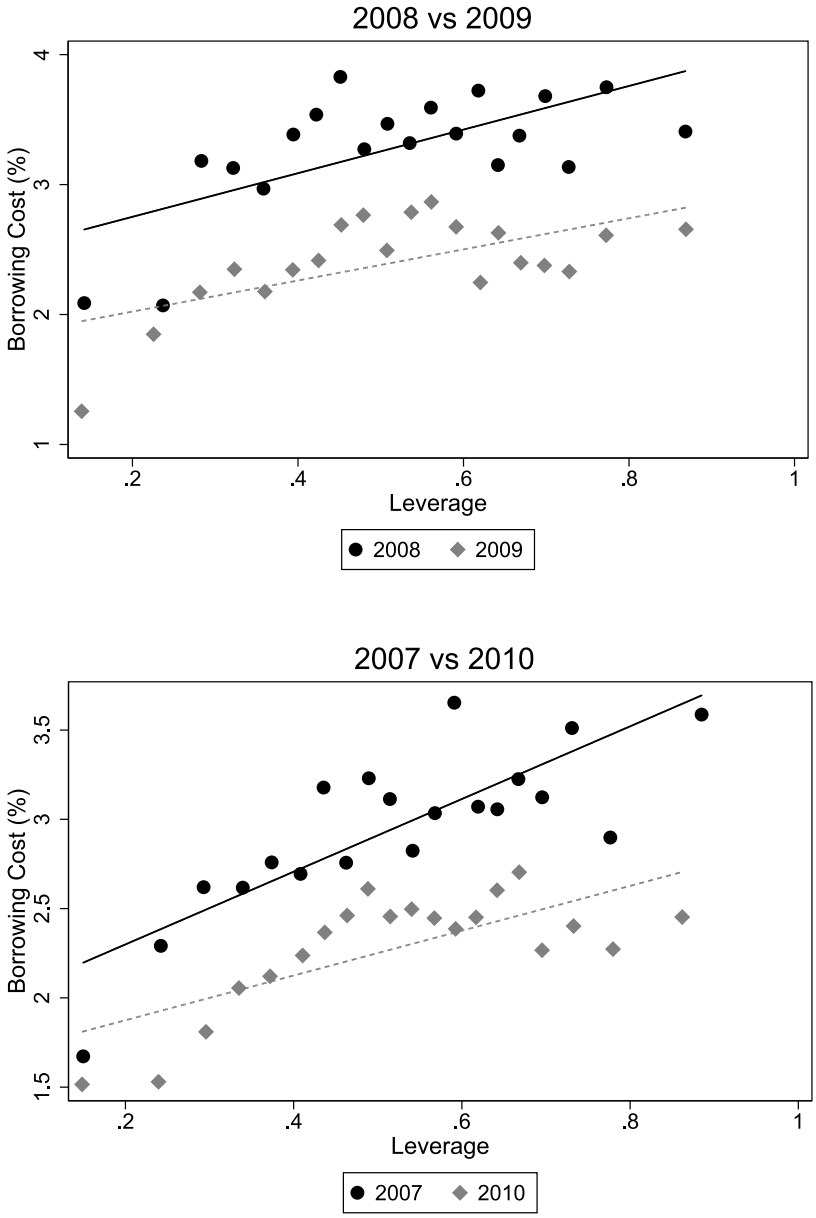

Figure 4. Borrowing cost versus leverage for public non-financial firms in China before and after the 2008 Credit Push. The figure in the upper panel compares 2008 vs 2009. The figure in the bottom panel compares 2007 vs 2010. For ease of appearance, the points are grouped into 20 bins of around 70 observations each. The lines are the fitted regressions for each year. Source: CSMAR database.

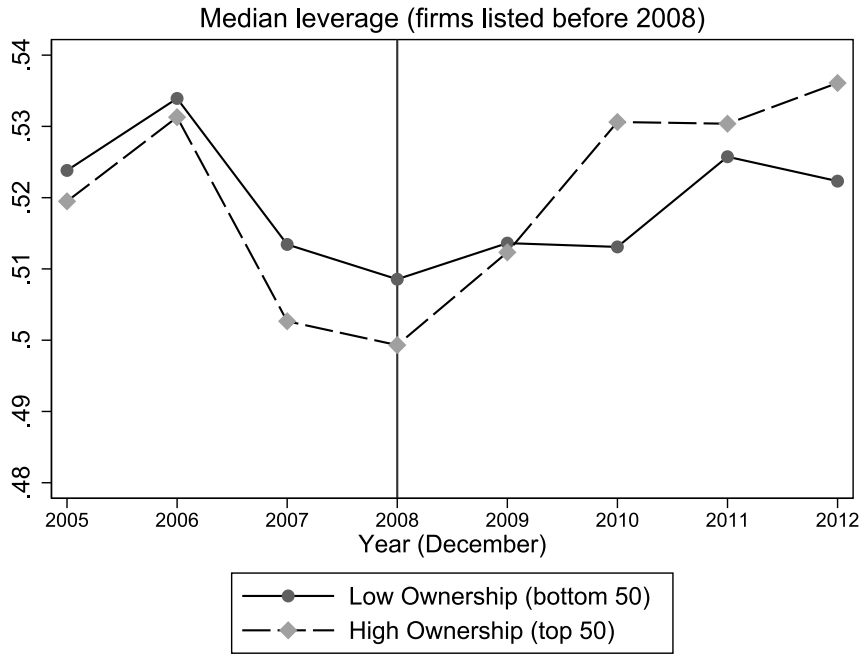

Figure 5. The median book leverage ratio for the non-financial public firms. The vertical line is end of 2008, which is when the credit stimulus was announced by the Chinese government. The solid line is the median leverage for the group of firms with top 50 percentile executive ownership in 2008, the dashed line is the median leverage for the group of firms with bottom 50 percentile executive ownership in 2008. Source: CSMAR database.

NOT-FOR-PUBLICATION
Online Appendix A

A. Empirical Analysis of Interest Cost

One firm characteristic that deserves a special mention is the Interest Expense Ratio, which captures the borrowing costs of a firm. We estimate this variable following Pittman and Fortin (2004) as the ratio of interest expenses to total debt:

$$Borrowing\,Cost = Interest\,Expense\,Ratio = \frac{Interest\,Expense}{Short\,Term\,Debt + Long\,Term\,Debt}. \tag{1}$$

While the visual evidence provided in Figure 4 points to a significant downward shift in borrowing costs, we test this more formally by estimating a regression model of the following form:

$$\begin{aligned} Borrowing\,Cost_{it} = \beta_0 + \beta_1 Leverage\,Ratio_{it} + \beta_2\,Credit\,Push_t + \\ + \beta_3 Leverage\,Ratio_{it} \times Credit\,Push_t + \sum_k \beta_k Controls_{itk} + \alpha_j + u_{it} \end{aligned} \tag{2}$$

where the $Borrowing\,Cost$ is the interest expense ratio as defined in (1), $Book\,Leverage$ is as defined in equation 1 in the paper, $Credit\,Push$ is a dummy variable that equals one for 2009 (post-stimulus) and zero for 2008 (pre-stimulus), and α_j is the industry fixed effect. The controls $\sum_k \beta_k Controls_{itk}$ are return to assets, size of the firm, market-to-book ratio, bank holding.

We report the results in Table A1. The key coefficients of interest are $Credit\,Push$ and its interaction with $Book\,Leverage$. In column 1 of Panel A we present the results where we control for the firm characteristics and include any fixed effects. We obtain a coefficient of -0.30 for $Credit\,Push$. The coefficient for $Credit\,Push \times Book\,Leverage$ is -0.845, and it is significant at the one percent level. Thus, while the credit push lowers the cost of borrowing across all firms, it is especially powerful in reducing the borrowing costs for firms that choose high leverage.

In other Columns from 2 through 4, we re-estimate our benchmark regression specification by introducing industry fixed effects and the using the market leverage as the alternative specifications. Our results hold for these alternative specifications.

Table A1. Cost of leverage before and after the Credit Push

	Interest Expense (%)			
	(1)	(2)	(3)	(4)
Book Leverage$_{i,t}$ × Credit Push$_t$	-0.845***	-0.903***		
	(0.009)	(0.004)		
Book Leverage$_{i,t}$	1.732***	2.201***		
	(0.000)	(0.000)		
Market Leverage$_{i,t}$ × Credit Push$_t$			-0.861**	-0.744**
			(0.021)	(0.039)
Market Leverage$_{i,t}$			2.025***	2.382***
			(0.000)	(0.000)
Credit Push$_t$	-0.301	-0.256	-0.318**	-0.292**
	(0.125)	(0.184)	(0.032)	(0.044)
Firm's Controls	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes
Observations	1956	1956	1956	1956
R^2	0.117	0.205	0.118	0.203

This table estimates equation 2. The sample covers 2008 and 2009. The controls are return to assets, size of the firm, market-to-book ratio, bank holding. The p-values are in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level. The variables are defined in the Appendix. The standard errors are clustered at the firm level.

Table A2. Decomposition per sectors.

			Mean			
	# obs	% obs	Interest Cost	Book Leverage	Market Leverage	Executive Ownership
Agriculture	50	1.66%	3.4194	0.4068	0.1847	3.15%
Mining industry	113	3.76%	2.4731	0.4476	0.2175	0.17%
Manufacturing	1732	57.60%	3.0737	0.4809	0.2802	2.56%
Energy industry	157	5.22%	4.0240	0.6002	0.4296	0.02%
Building industry	80	2.66%	1.7846	0.6777	0.4735	1.73%
Wholesale and retail	246	8.18%	2.5972	0.5596	0.3302	0.10%
Transportation	123	4.09%	2.8235	0.4435	0.3103	0.01%
Hotel and catering	18	0.60%	2.6862	0.3297	0.1523	0.15%
Information	84	2.79%	2.1412	0.3736	0.1831	6.43%
Real-estate	253	8.41%	2.0776	0.5677	0.3617	0.52%
Leasing and business	32	1.06%	2.5428	0.4595	0.2726	3.22%
Scientific and technology	8	0.27%	0.9568	0.4870	0.1862	0.19%
Environment	29	0.96%	3.3394	0.4848	0.2588	0.03%
Education	2	0.07%	4.4044	0.5625	0.3422	0.04%
Health and social welfare	4	0.13%	0.9948	0.1659	0.0604	0.00%
Culture and sports	31	1.03%	2.2157	0.4847	0.2199	0.22%
Comprehensive	45	1.50%	2.8848	0.5145	0.3254	0.01%
Total	3007	100%	2.8895	0.4982	0.2972	1.85%

This table reports the sample statistics for each sector of the database. The sample covers 2008 and 2009. Source: CSMAR.