IMPACT OF BASEL III ON CHINESE FIRMS ACCESS TO CREDIT

A Thesis
submitted to the Faculty of the
Graduate School of Arts and Sciences
of Georgetown University
in partial fulfillment of the requirements for the
degree of
Master of Public Policy
in Public Policy

By

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Washington, DC
April 12, 2018
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ABSTRACT

Since the 2008 global financial crisis, the Basel Committee on Banking Supervision Committee implemented Basel III, a new set of regulatory standards on the banking industry. The main objective of Basel III is to strengthen the international banking system and improve market resilience. China has committed to upgrade the Chinese banking regulatory system and align it with international standards. After issuing a series of regulatory policies, Basel III in China has been considered as complete by Basel III Committee. Using a panel dataset of 3400 publicly traded firms’ financial figures from 2006 to 2015, this paper investigates the impact of Basel III on Chinese firms’ access to credit. The hypothesis of this paper is that the implementation of Basel III will have negative effects on firms’ accessibility to credit but the effect is heterogeneous, varies across firm ownership types and firm industries. Using the fixed effect model, this paper found China experienced a dramatic credit increase at the corporate level over the same time period. However, this is mainly driven by government policies to stimulate Chinese economy after the 2008 financial crisis.
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Introduction

After the 2008 global financial crisis, the Basel Committee on Banking Supervision (Basel Committee) set a priority on the implementation of the regulatory standards on the banking industry. The Basel committee published the Basel III Framework and formed the Regulatory Consistency Assessment Program to monitor and assess its member’s implementation of Basel III. The Framework operates on the principle that a sound and transparent set of regulations will help strengthen the international banking system, improve market resilience, and ensure an equal industrial environment for all types of investors. For the full set of Basel III standards and the enforcement schedule, see Figure 1, Basel III Implementation Road Map. (Basel Committee on Banking Supervision, 2013)

As one of the largest emerging economies, China has “claimed” to demonstrate a strong commitment to global regulatory reform and standards for the purpose of building a sound and resilient financial system. China Banking and Regulatory Commission (CBRC) is the supervising agency for China’s financial institutions. CBRC was formed to regulate supervisory policies for the banking industry, regulate market entry and operation, and monitor behavior that might violate law and regulations. In June 2012, the CBRC issued the core elements and timeline of the Basel III capital standards. Later that year, it also published additional requirements on capital instrument innovation, transitional arrangements, and capital adequacy ratio reporting. Compared with the previous regulation, the major changes related to the treatment of banks’ exposures to central counterparties and the disclosure requirements for capital instruments. In addition, CBRC also announced several technical clarifications and requirements to make Chinese capital regulations consistent with the international Basel III standards.
However, despite revising major parts that are required by Basel III, CBRC decided not to rectify all identified deviations, specifically those relating to credit risk standardized approach and disclosure requirements. Considering the potential effect of these underdressed regulations, China is graded as “Largely Compliant”, in particular due to the lack of full compliance with the Basel III standards concerning the disclosure of detailed information on credit risk.

Since its announcement, Basel III has a large effect on the world’s financial systems and economies. On the positive side, with toughened capital and liquidity requirements, Basel III will make the global financial system safer. On the other hand, this extra safety comes at a cost. It is expensive for banks to hold extra capital and decrease their competitiveness compared with other financial institutions. (Brookings, 2010) Some scholars believe that Basel III will seriously harm the economy. While imposing more stringent standards for banks through measures such as increasing capital holdings, Basel III does have its own costs, and many of these are pushed on customers, particularly small and medium businesses (Padgett, 2012) According to Institute of International Finance (IIF), the US and Europe’s economies will be 3% smaller after 5 years due to the adoption of Basel III. When evaluating the effect of Basel III, it’s important to analyze its impact on the general economy, not just focus on banking industry. In this thesis, I used a panel data set consisting of financial data of 7000 publicly traded firms in Shanghai and Shenzhen Stock markets. I will first analyze the effect of Basel III on the Chinese economy by looking at its impact on firm’s access to credits, and comparing the heterogeneous effects on different industry and ownership types of firms.
## Basel III phase-in arrangements

(All dates are as of 1 January)

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<td>Minimum common equity plus capital conservation buffer</td>
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<td>40%</td>
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<td>Minimum Total Capital plus conservation buffer</td>
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<td>Net stable funding ratio</td>
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<td>Introduce minimum standard</td>
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* Including amounts exceeding the limit for deferred tax assets (DTAs), mortgage servicing rights (MSRs) and financials.
– – transition periods

**Figure 1: Basel III Implementation Road Map**
Background

With the trend of globalization and the international flow of capital and goods, international banks are exposed to more challenges due to the increasingly changing environment. In order to measure the bank’s ability to absorb losses and market resilience, in 1988, the original Basel Accord (Basel I) was designed. The goal of Basel I is to establish minimum levels of capital for internationally active banks, and then give each banking supervisors authorities to set higher levels of capital requirements.

Basel III is the third version of Basel Accord. It’s an internationally agreed set of measures developed by the Basel Committee on Banking Supervision in response to the financial crisis of 2007-09. The aim of this revision is to strengthen the regulation, and supervision of risk. Under Basel III, banks must fund themselves with 4.5% of common equity of risk-weighted assets (RWAs). By 2015, a minimum Common Equity Tier 1 (CET1) ratio, calculated by CET1/RWAS, of 4.5% must be maintained. In addition, the minimum Tier 1 capital required, composed of 4.5% of CET1 plus an extra 1.5% of Additional Tier 1(AT1), increased to 6%. The capital requirement is considered as a mandatory “capital conservation buffer” for all banks. Besides the capital requirements, Basel III also introduced a minimum “leverage ratio.” This is calculated by dividing Tier 1 capital by the bank’s average total consolidated assets. The banks are expected to maintain a leverage ratio in excess of 3% under Basel III. In addition, banks are required to hold sufficient high quality liquid assets to cover its total net cash outflows over 30 days and need to have the amount of stable funding to exceed the required amount of stable funding over a one-year period.
Since 2010, after Basel III was proposed, China has issued a series of policies, in order to implement the outcomes of international financial regulatory reform, incorporate Basel III with domestic regulation, and prepare for the opening of Chinese financial market in the future. On August, 2011, CBRC released a consultation draft of new measures on capital management for banks, which was implemented on January, 2012.

Table 1. Basel III Requirements and Timeline in China

<table>
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<tr>
<th>Bank Category</th>
<th>Requirements</th>
<th>Timeline</th>
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<tr>
<td>Systemically important commercial banks</td>
<td>Core Tier 1 Capital Adequacy Ratio: not less than 8.5%</td>
<td>2015</td>
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<td></td>
<td>Tier 1 Capital Adequacy Ratio: not less than 9.5%</td>
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<td></td>
<td>Capital Adequacy Ratio: not less than 11.5%</td>
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<tr>
<td>Other commercial banks</td>
<td>Core Tier 1 Capital Adequacy Ratio: not less than 7.5%</td>
<td>2016</td>
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<td></td>
<td>Tier 1 Capital Adequacy Ratio: not less than 8.5%</td>
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<td></td>
<td>Capital Adequacy Ratio: not less than 10.5%</td>
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<tr>
<td>Rural cooperative banks</td>
<td>Core Tier 1 Capital Adequacy Ratio: not less than 7.5%</td>
<td>2018</td>
</tr>
<tr>
<td></td>
<td>Tier 1 Capital Adequacy Ratio: not less than 8.5%</td>
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<td></td>
<td>Capital Adequacy Ratio: not less than 10.5%</td>
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</table>

The systemically Important banks in China are Bank of China, ICBC, Agricultural Bank of China, and China Construction Bank. These four banks are majority state-owned and publicly traded in China. Other commercial banks include large commercial banks majority owned by the central government and banks that are majority owned by local governments, such as China Everbright Bank, Postal Savings Bank of China, and Bank of Beijing. In the end, rural cooperative banks are small and medium sized regional banks that are mainly jointly owned by private sectors and local governments.

According to CBRC, systemically important commercial banks should reach 8.5% Core Tier 1 Capital Adequacy Ratio and 9.5% Capital Adequacy Ratio by 2013, then obtain a 11.5% Capital Adequacy Ratio by the end of 2015. Other commercial banks should
satisfy 7.5% Core Tier 1 Capital Adequacy Ratio, 8.5% Capital Adequacy Ratio, and 10.5% Capital Adequacy Ratio. For rural cooperative banks and rural banks, they should satisfy the above requirement by 2018.

Based on the annual and semi-annual reports of the systemically important commercial banks and other representative commercial banks in 2010 and 2011, the core capital adequacy ratios of the four representative banks have all obtained above 7.5% core capital adequacy ratios and above 10.5% capital adequacy ratios. Thus, the banking industry has already reached the standards of capital adequacy proposed by CBRC. (Zou. Y, 2012)

In the Leverage ratio management of commercial banks, issued on May, 2011 by CBRC, it set forth that leverage ratio is calculated by using eligible tier-1 capital to the adjusted balance on and off balance sheet. In addition, it sets the minimum leverage ratio requirement at 4%, which is 1% above the Basel Committee proposal. In 2010, according to a quantitative estimation conducted by Basel Committee, the average leverage ratio of Chinese banks was 4.6%, exceeding the requirement of Basel III. (Basel Committee on Banking Supervision, 2013)

According to the Rules Governing Liquidity Risk Management of Commercial Banks, all domestic and foreign commercial banks registered within China need to establish a sound liquidity risk management system in accordance with the guidance and also point out indicators that banks should meet, including Liquidity coverage ratio, net stable funding ratio, Loan to deposit ratio and liquidity ratio. Based on the annual reports in 2011, all
systematically important banks and representative commercial banks have met the regulatory requirements. (Zou.Y 2012)

In conclusion, China’s banking industry has mainly reached the quantity standards of Basel III. However, besides the promising quantitative criteria, there are still substantial improvement room left for the banking industry. For example, common equity is considered as tier-1 capital. It indeed can serve as a buffer for high risk assets, but the high cost it brings will put Chinese banks at a disadvantageous position.
Literature Review

China has issued a series of policies and regulations since Basel III published. On August 15, 2011, the China Banking Regulatory Commission (CBRC) released a consolidated draft of new requirements on capital management for banks and the new approach was implemented on January 1, 2012. This has had a varied impact on Chinese banking and other capital intense industries. However, the level and degree of impact is not consistent across industries and varies with company’s ownership type. The following chapter reviews literatures regarding this topic, beginning with the analysis of the regulatory policies’ impact on banks and firms’ decisions, moving to the analysis of investment behaviors of Chinese firms in the past decade, and then analyzes Chinese banking industry’s lending behavior and how that may be impacted by Basel III in the end.

Many scholars believe that Chinese authorities use Basel III as an external pressure to restrain banks from lending resulted by the global financial crisis in 2008. Also the implementation of Basel III will increase the reputation of Chinese banks and help them to develop overseas business. On the other hand, the adoption of Basel III has put pressure on Chinese banks. In the past, Chinese banks were protected by regulated interest and exchange rates as well as other local company protection policies. Although having a more developed system will better prepare Chinese banks for the inflow of global capital, it will produce other outcome in the process. One clear impact is banks now apply stricter loan provision rules and decreasing the access of credit for the market in general. (Sekine, 2011)
A. Effects of banking environment on corporate finance decisions

Although regulation changes are expected to impact the banking sector and affect banks’ lending behavior due to cost benefit analysis, the impacts are heterogeneous for different types of firms. Based on the banking industries in U.S., newly formed corporations tend to borrow and invest less after an increase in competition in the banking sector. However, this effect fades as firm’s age and reverses sign for older companies. (Zarutskie, 2006) When experiencing a loss of regulation on banking sectors, research shows that enhanced competition in the EU banking system actually fosters the development of small and middle size firms (Cetorelli, 2004). Similarly, international evidences show that competition among banks will lead to fewer financial obstacles for small and middle firms (Beck et al, 2004). These studies focus on the competition within the banking industry, however, and this is not very applicable in the Chinese case since the banking sector is still controlled by the government. Instead, my study puts emphasis on the ownership type of firms in China.

Studies show that under the state ownership of banks, corporate borrowing and investment behaviors will be affected not only by firm level financial and economic factors, but are also affected by the governments’ politically determined lending policies. Firms that have a higher state owned percentage will still have access to credit regardless of their growth rate and performance. (Firth, Lin and Wong, 2008) My research will analyze this relationship among banks lending behavior and firms type before and after the implementation of Basel III. In addition, banks ownership will also be taken into consideration. Prior studies have not demonstrated the effect of the implementation of Basel III on different ownership types of firms in China.
B. Effects of banking environment on banks loan approval decisions

After analysis over 800 loan announcement and their corresponding market reactions, researchers found that firms with weak internal and external management techniques are more likely to get loans than others. (Byers at al 2008) Previous studies also pointed out that commercial banks could have positive influence on corporate governance. However, this does not apply to the Chinese case since Chinese banks are mainly owned by the state and are obligated to lend to SOEs, even those that are underperforming. With the implementation of Basel III, this bond between states owned banks and SOEs are supposed to fade due to the adoption of more performance based evaluation. In addition, researches show that there are heterogeneous effect between leverage and investment among various firms. The investment returns are significantly higher for some business segments than others. This will also explain the impact on firm business development on certain level.

C. Chinese banking industry and its lending behavior

In the past two decades, China has gradually transformed from state owned to a market orientated economy, but it still maintains dominant state ownership in key industries, such as banking, transportation and resources heavy industries. One of the reasons of doing so is to channel bank deposits to the ailing State Owned Enterprises (SOE), which are legal entities that undertake commercial activities on behalf of Chinese governments (Allen et al., 2005; Dobson and Kashyap, 2006). China’s banking industry has the highest share of state ownership and the government retains the ownership to reserve the option to direct credit. (Dobson and Kashyap, 2006) Statistics show that the private sector accounts for 50% of the country’s economy but only accounts for 7% of bank lending.
Although it is generally harder for smaller and private firms to get credit compared with more established firms, the obstacles are more significant in the Chinese case.

Chinese banks, mainly state-owned banks, have obligations to lend to SOEs even to the poorly performing ones. This is also a major cause of the enormous level of non-performing bank loans. Unprofitable SOEs are usually firms with poor fundamentals and inherently have a high default risk. Knowing that central government will bailout the state-owned firms, Chinese banks used to have legitimate grounds to ignore the quality of loans, and most banks have under-developed due-diligence monitoring systems.

However, since a key goal of Basel III is increase bank’s risk management systems and standardize Chinese banks’ system, the implementation of Basel III could also have a negative impact on poorly performing SOEs in China, by decreasing their chance of getting loans. Under Basel III, banks are under high pressure to be more transparent and have a more “healthy” balance sheet and capital structures. Therefore, Chinese banks have to incorporate Basel III’s new regulations and are more likely to reduce certain lending activities to effectively improve the capital quality on their balance sheets.
Hypothesis and Conceptual Model

The hypothesis of this paper is that the implementation of Basel III will have negative effects on firms’ accessibility to credit but the effect is heterogeneous. In other words, firms within different industries and have different ownership types are affected in different amounts by Basel III. In order to test this hypothesis, I will employ a two-stage theoretical framework to examine the determinants of firm’s access to credit and test how the implementation of Basel III’s impact on credit accessibility differs across firm’s characteristics: firm size, ownership type, profitability, and industry the firm belongs to.

In the first stage, I introduce general factors into the model to examine their influence on firm’s access to credits from banking sector: ownership type, firm profitability, Industry, GDP growth rate, central bank interest rate, public expenditure, and total employment population. The first two factors belong to the same group. They all measure firm level performance and are used for banks when they evaluate firm’s loan application. I use data from 2006 to 2015, when the Chinese banking sector and economy already changed a lot in that decade. Theoretically, a more developed market will increase the positive correlation relationship between firms’ performance and their access to credit. However, as one of the most regulated banking industries in the world, Chinese banks may have different behavior that are affected by regulatory policies in different industries. The remaining factors I included are used to control for the general economic condition of China.

In the second stage, after controlling the effect of economic and firm level variables, I explore how the influence of these factors on firm’s credit accessibility changes after the implementation of Basel III. It is important to capture such difference empirically, especially when China has developed a lot in the past decade and non-SOEs are taking an
increasingly large share of the Chinese economy. If Basel III does achieve the intended policy effects, it will increase private firm’s access to credit and help Chinese economy to transform from policy driven to market driven. In the next part, I will discuss my model in detail, provide justifications for including them into the model and how they can be measured in an aggregate level.

Figure 2: Impact of Basel III on Firms’ Access to Credit
Methodology and Data

Prior researches focusing on firms’ accessibility to credit have used certain financing measure as endogenous variables to measure their impact. Short-term debt to total debt and total debt to total liabilities ratios are use in past researches. (Bougheas at al. 2006) These ratios correspond to measures of access to bank and total external financing. In the Chinese case, these ratios do not have the exact same interpretation as the UK case. Hu and Zhou (2006) used short term debt to total asset ratio and total short term debt from banks as their dependent variables to study public firms’ debt structure in China. After combining the previous study and evaluating data availability, I chose to use the natural log of firm loan size from banks as my key dependent variable.

The first set of explanatory variables is related to firm’s operational data that drawn from firm’s annual report. The first explanatory variable is firm size, measured by the natural logarithm of firm total revenue and profit in RMB. (log_Revenue and Log_Profit). As mentioned by Oliner and Rudebusch (1996), Kashyap et al. (1996), Atanasova and Wilson (2004), firm size is an important factor that affects a firm’s financing decisions. In Bougheas et al (2006)’s study, its empirical research results support the finding that a firm will expand its non-bank debt size when increasing its size. In the Chinese case, we can use firm size combined with international expansion strategies to test this hypothesis.

The second variable is ownership type of firms. This is a dummy variable indicating state owned, and non-state owned. Under the state-owned category, firms may range from wholly state owned to minority state owned; however, indirect state ownership is not capture in the data set. This category definition is also used by Dow Jones Risk database,
a major risk data base that is used to measure firms political exposure. As a regulated economy, state owned firms used to have more access to credit regardless of their performance. I will use this variable to test whether the implementation of Basel III has mitigated the effect of state ownership. The third variable is which industry firms are in. Similar with the ownership type, firms in government target industry should have more access to credit, both banking and non-banking loans. This variable will test the above hypothesis.

The fourth variable is the ratios of firm profits to equity capital, as a measure of firm profitability. Specifically, I will calculate firm return on equity (ROE) and return on asset (ROA). Theoretical model suggests that firms with greater profit potential should have less need for short-term debt and hence a negative relationship with short-term financing measures. However, Boughes et al. (2006)’s study suggest that more profitable firms can get more financing overall, regardless of funding source. Other financial ratios, such as quick ratio, are also controlled in the model.

The second set of explanatory variables are related to the implementation of Basel III in China that draw from Chinese bank’s annual report. The key independent variable is a categorical variable that measures the implementation status of Basel III in China. According to CBRC, Basel III started in 2009 and graded as completed in 2013. This year is used as an indicator of compliance status in my model. Data before 2009 is measured as uncompliant, while after 2013 is considered as compliant.
I also include macroeconomic variables in my analysis to capture the changing economic conditions during my sample period. In previous research, various authors used GDP growth rate. However, since I will only focus on GDP changes between 2006-2015, and GDP growth rate is relatively unstable in the short and middle term, actual GDP size is more suitable for my study.

Another important macroeconomic variable that affects firm’s access to credit is interest rate in the Chinese interbank market. The interest rate affects the cost of borrowing, which is a function of overall monetary policy, bank’s market power, and the risk of the non-financial firms. I consider the risk mainly as the cost of firm borrowing, regardless of the cause of the change of interest rate. In the end, I will include the stock market index to control for firms other access to capital. Public expenditure also has significant impact on firm’s access to credit. On one hand, state owned firms will receive direct funding from the central government under financially difficult periods, such as during 2008 financial crisis. Therefore, the decrease in their bank loans is not a result of Basel III but due to other financial support from the government. The last factor I controlled for is total employment population in different industries, to control for the different industrial effects on firms.
**Analysis Plan**

The stock market in China was created as a funding-raising venue for SOEs and are generally more well used by private firms in China. Currently there are three major types of stock markets in China. The Shanghai Stock Exchange and Shenzhen Stock Exchange are the major stock markets in China. SOEs and large private companies are listed on these two markets. The Growth Enterprises Market was founded on 2009 in China and mainly focuses on firms in high technology industries. A new OTC Market was founded on 2013 and firms have to be located in certain industrial parks to apply. Since Basel III was implemented in 2012 in China, I will use companies listed on the major two markets as my sample pool. In previous research, the sample size is around 3,000 to 4,000 firms. I plan to use similar sample size and collect firms’ financial data from 2006 to 2015, to get a total of around 3,000 firms as my sample size. The data is in excel format, but I have cleaned the data for reading key dependent variable into STATA.

One potential concern is firms have different format of annual reports, some of them may not be as detailed as others. Thus, the quality of these data could vary across companies. In addition, the Growth Enterprises only start on 2009, so the data for 2006 – 2008 will be missing. I may need to drop those observations, which may cause selection bias. Also, a large part of the large Chinese private companies are also listed overseas and have access to credit from international capital, and not being able to include them may lead to an upward sample bias.

One possible framework for analyzing the relationship between firms’ access to credit and the implementation of Basel III in China is a panel model, since the firms’
accessibility to credit is affected by their prior decisions. As explained in the conceptual model, coefficients need to be significant to prove my research question is valid. In addition, it’s necessary to consider firm heterogeneity since firms could have different predispositions to take on more banking debt or borrow other credit from non-bank institutions. OLS regression will not eliminate fixed effects in this case and thus not all of the explanatory variables will be strictly exogenous, leading to potential omitted variables bias.

To avoid the above issues, I will use a fixed effect model as my key statistical analysis model. A fixed effect model is suitable for variables that are constant across firms. Fixed effects models remove the omitted variable bias by caused by the group specific effects by calculating changes within groups (in this case company) across time. A starting point is to estimate an OLS model that only includes firm operational variables, firm ownership type, and macroeconomic variables. The empirical “baseline” model is the following:

\[
\text{Log Loan Size} = \beta_1 \text{Basel III Complete} + \beta_2 \text{Log Revenue} + \beta_3 \text{Log Profit} + \beta_4 \text{Ownership Type} + \beta_5 \text{ROE} + \beta_6 \text{ROA} + \beta_7 \text{Profit Margin} + \beta_8 \text{Liquidity} + \beta_9 \text{Current Ratio} + \beta_{10} \text{Asset to Debt} + \beta_{11} \text{Cash Ratio} + \beta_{12} \text{Log GDP} + \beta_{13} \text{Deposit Interest Rate} + \beta_{14} \text{Loan Interest Rate} + \beta_{15} \text{Employment population} + \beta_{16} \text{Log public expense} + \beta_{17} \text{Bad Loan} + \beta_{18} \text{Ownership} + \beta_{19} \text{Ownership} \times \text{Basel III Complete} + \epsilon
\]

My second specification is the fixed effect model using similar variables apart from firm ownership (firm ownership is fixed over time and thus drops out of the fixed effect model).
\[ \text{Log Loan Size} = \beta_1 \text{Basel III Complete} + \beta_2 \text{Log Revenue} + \beta_3 \text{Log Profit} + \beta_4 \text{Ownership Type} + \beta_5 \text{ROE} + \beta_6 \text{ROA} + \beta_7 \text{Profit Margin} + \beta_8 \text{Liquidity} + \beta_9 \text{Current Ratio} + \beta_{10} \text{Asset to Debt} + \beta_{11} \text{Cash Ratio} + \beta_{12} \text{Log GDP} + \beta_{13} \text{Deposit Interest Rate} + \beta_{14} \text{Loan Interest Rate} + \beta_{15} \text{Employment population} + \beta_{16} \text{Log public expense} + \beta_{17} \text{Bad Loan} + \beta_{18} \text{Ownership} + \epsilon \]

My third analysis is using fixed effect model to conduct sub industry regressions using firms in 18 different industries.
Descriptive Statistics

Table 2.a Bank Loan Summary Statistic

<table>
<thead>
<tr>
<th>Year</th>
<th>Observations</th>
<th>Non Zero</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Total</th>
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<td>49</td>
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<td>1388</td>
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Table 2.b State-Owned Company Bank Loan Summary Statistic

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<th>Mean</th>
<th>Total</th>
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<td>0</td>
<td>10000</td>
<td>110</td>
<td>111919</td>
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Table 2.c Non-State-Owned Company Bank Loan Summary Statistic

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<th>Total</th>
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<td>6500</td>
<td>110</td>
<td>111919</td>
</tr>
<tr>
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<td>267914</td>
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<td>2450</td>
<td>637</td>
<td>0</td>
<td>47150</td>
<td>1677</td>
<td>950669</td>
</tr>
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<td>2014</td>
<td>2450</td>
<td>788</td>
<td>0</td>
<td>94550</td>
<td>13350</td>
<td>1705066</td>
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<tr>
<td>2015</td>
<td>2450</td>
<td>895</td>
<td>0</td>
<td>89348</td>
<td>368</td>
<td>2667303</td>
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</table>
Regression Results

The following table 3 presents a comparison of the pre- and post- Basel III total loan size for all publicly traded firms on the Shanghai and Shenzhen stock markets.

**Table 3. Total Bank Loan Size Before and After Basel III (RMB, Million)**

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2015</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank Loan Amount</td>
<td>51,777.64</td>
<td>4,120,829.41</td>
<td>4,069,051.77</td>
</tr>
</tbody>
</table>

Source: Wind database, January 2018

According to the results in Table 3, the total bank loan size increased by 4,069 billion RMB, and by 3,133 billion RMB if we index for inflation. The large abnormal expansion of bank loan size between 2006 and 2015 in China may lead to a causal relationship between the implementation of Basel III and the bank loan size. In contrast to the purpose of Basel III, which was to improving banks loan quality and risk management systems, Basel III actually didn’t increase the effort needed for firms to get credit from commercial banks. While inflation accounted for part of the reason for this growth in
loans, even after controlling for inflation there are still 3,133 billion in growth in loans that are not explained. However, this simple before and after comparison does not account for any macro economic factors and firm level factors. The large increase in bank loan size can be driven by the economic growth, lack of other financing sources, and individual firm decisions.

Therefore, I conduct further analysis starting with using a simple OLS model. Column 1 in Table 4 reports the results from that model. The dependent variable for this model is the natural log of bank loan size between 2006 and 2015. The key independent variable of interest is the implementation status of Basel III. I created a dummy variable that uses year as a deciding factor. After 2009, Basel III is considered as being completely implemented in China and that’s thus I create my categorical variable for Basel III completion to indicate whether the year was after 2009. As we can see in the table below, the coefficient of Basel III completion is 5.45 and is significant at a 5% level. That means after Basel III was carried out in China, the total loan size increased by 545%. However, there are many other factors that need to be taken into account. In the next model, I regress log of bank loan on firm financial indicators, such as the log of revenue, profit and return on asset. When banks evaluate loan applications, firm operation data is the most important criteria. A firm with high profitability is more likely to get a loan and vice versa. After controlling for firm level financial figures, the coefficient of Basel III’s implementation dropped to 4.43. In order to control for multicollinearity issues between independent variables, I generally added these control variables and the regression results are shown in the table below. Although there are certain correlation between these variables, controlling them will improve the quality of my model in general.
From Table 5, Column 2, the regression result also shows that different financial indicators have different impacts on the loan size. The log of revenue has a coefficient of 1.15 at 5% significance level while the coefficient for the log of profit is not significant. This could be because companies with larger revenue are larger in scale and thus need to borrow larger loans. The coefficient of ROA is negative 2.83 and the coefficient of ROE is negative 1.18. One explanation is for firms with high profitability, it is easier for them to raise capital from other sources from stock market and bond market. Therefore, they could choose not to apply for bank loan in the first place. The other significant coefficient is current ratio, which measures a company’s ability to pay short-term and long-term obligations.
A firm’s current ratio increase by 1, it will increase its bank loan size by 50.8% holding other factors constant. In addition, macro-economic variables, including log of GDP, and employment rate by industry, are included to measure the effect of economic condition on banks’ loan giving decisions and firms’ loan needs.

Table 5.a Comprehensive Model Regression Results

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1) Simple OLS Log Loan</th>
<th>(2) OLS Firm Performance Log Loan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basel III Complete</td>
<td>5.456*** (0.113)</td>
<td>4.436*** (0.120)</td>
</tr>
<tr>
<td>Profit</td>
<td>-2.436 (2.090)</td>
<td></td>
</tr>
<tr>
<td>Revenue</td>
<td>1.154*** (0.109)</td>
<td></td>
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<tr>
<td>Profit Margin</td>
<td>-0.00109** (0.000545)</td>
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<tr>
<td>Liquidity</td>
<td>0.508*** (0.111)</td>
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</tr>
<tr>
<td>Current Ratio</td>
<td>-0.761*** (0.142)</td>
<td></td>
</tr>
<tr>
<td>Asset to Debt</td>
<td>-0.00610** (0.00309)</td>
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<tr>
<td>Cash Ratio</td>
<td>0.151* (0.0787)</td>
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<tr>
<td>ROE</td>
<td>-1.181** (0.488)</td>
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<tr>
<td>ROA</td>
<td>-2.840*** (0.986)</td>
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</tr>
<tr>
<td>Log GDP</td>
<td></td>
<td></td>
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<tr>
<td>Deposit Interest Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loan Interest Rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment tier1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment tier2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment tier3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log Public Expense</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bad Loan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.136*** (0.0433)</td>
<td>35.17 (47.99)</td>
</tr>
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<td>Observations</td>
<td>34,670</td>
<td>28,647</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.087</td>
<td>0.097</td>
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</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, *
Table 5.b Comprehensive Model Regression Results

<table>
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<th>OLS Firm and Macro</th>
<th>Company Fixed Effects</th>
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<tr>
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<td>(3)</td>
<td>(4)</td>
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<tr>
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<td>Log Loan</td>
<td>Log Loan</td>
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<td>Basel III Complete</td>
<td>2.326***</td>
<td>1.412***</td>
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<tr>
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<td>(0.545)</td>
<td>(0.448)</td>
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<td>(2.061)</td>
<td>(0.419)</td>
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<tr>
<td>Revenue</td>
<td>1.109***</td>
<td>1.056***</td>
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<td>(0.108)</td>
<td>(0.252)</td>
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<td>(0.000378)</td>
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<td>Liquidity</td>
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<td>(0.0924)</td>
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<td>(0.0805)</td>
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<td>(0.396)</td>
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<td>-5.896**</td>
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<td>(3.142)</td>
<td>(2.806)</td>
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<td>875.6***</td>
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<td>(98.90)</td>
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<td>-1.125***</td>
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<td>(137.1)</td>
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<td>(5.074)</td>
<td>(4.278)</td>
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<td>Bad Loan</td>
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<td>R-squared</td>
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</table>

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, *

As mentioned in the previous paragraph, there are some additional factors that could be controlled for. As a result for the next model three variables regarding loan interest rate
are included. In China, the central bank has full autonomy when it comes to monetary policies. In other words, Chinese central bank set banks interest rate on behalf of commercial banks in China. Therefore, People Bank of China’s basic interest rate has large influence on the market loan interest rate and interest rate for savings. Interest rate is the cost for firms to borrow money from banks, thus it is important to take that into consideration. The last independent variable included is the size of bad loans, which measures the size of bank loans that has repayments are not being made as originally agreed between the borrower and the lender, and which may never be repaid.

Table 5 Column 3 reports the coefficient for independent variables for my standard OLS model controlling for both firm performance and macro-economic data. The coefficient of interest in the model for Basel III is still significant but drops further, to 2.33. Therefore, it can be concluded that economic condition has a large impact on both banks loan giving decision and firm’s need to apply for bank loans. The coefficient of Log GDP is negative 13.27, meaning that one percent of GDP growth will lead to 13.27% decrease in the total loan size.

One might wonder whether different type of firm ownership have direct or indirect impact on firm’s access to credit. In order to answer this question, a firm ownership categorical variable is included to further analyze the heterogeneous effect of Basel III on different ownership type if firms. Publicly traded firms in the data are categorized into two categories, state owned and non-state owned. Firms that are partly state-owned are put under state owned category. The reason the firm ownership type are important then analyzing firm access to credit is that most large banks in China are owned by state or
local government. Therefore, sometimes banks are obligated to lend to state-owned firms that are not performing well. However, these loans are likely to become bad loans and are supposed to decrease when Basel III put more strict regulation rules on banks.

Table 6 Firm Ownership Regression Model Results

<table>
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<th>(1) Ownership OLS</th>
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<tr>
<td></td>
<td>(0.000530)</td>
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<td>Liquidity</td>
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<td>Employment tier1</td>
<td>0.0128</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0177)</td>
<td></td>
</tr>
<tr>
<td>Employment tier2</td>
<td>0.0118</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0132)</td>
<td></td>
</tr>
<tr>
<td>Employment tier3</td>
<td>0.0110</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0150)</td>
<td></td>
</tr>
<tr>
<td>Log Public Expense</td>
<td>3.126</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5.054)</td>
<td></td>
</tr>
<tr>
<td>Bad Loan</td>
<td>46.78</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(37.47)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-775.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1,150)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>28,647</td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.119</td>
<td></td>
</tr>
</tbody>
</table>

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, *
Table 6 shows the results of this regression. The coefficient of Basel III completion dropped further, to only 1.92. The coefficient of state-owned firm is 0.980 and still significant at 1% level. The coefficient of the interaction variable between ownership and state-owned firm is 1.376, meaning the Basel III’s impact are larger on state-owned firms. However, these results are different from my hypothesis and could have multiple explanations. The most common explanation is the too big to fail assumption. Banks are more likely to approve loans for state owned companies assuming that government will bailout these state-owned firm in the end. For example, In February, 2018, Chinese government took over Anbang Insurance, reinforcing the assumption that government will step in to rescue before large firms collapsing.

Despite the meaningful results of these OLS models, the limitation of a simple OLS model is obvious for this case. The OLS model can’t capture the hidden effect of factors unique to each company that do not vary across time. For each individual firm, factors like executive management style have strong impact on firms’ decision making. In the panel data set where longitudinal observations exist for the same firm, fixed effects represent the subject-specific means. Fixed effects model also control for unobserved heterogeneity when this heterogeneity is constant over time. This fixed effects model includes all the same independent variables as the last OLS model, except the firm ownership type, which is constant over time and thus will be omitted from the model.

The results of the fixed effect model are reported as in Table 5 Column 4. The results are similar to OLS but the coefficients are smaller. This indicates that there is omitted variable bias that are not captured by OLS model and that running a fixed effect model is
more reliable. This fixed effect model will be my key regression model for further analysis. As shown in Table 5, first of all firm level performance indicators are included in this fixed effect model, such as profit, revenue, quick ratio, ROA, and ROE. Despite some of the coefficients being insignificant, these indicators are also used by banks when evaluating loan quality and are not directly affected by Basel III; thus it is important to control for them. The coefficient of firm revenue is 1.056 and significant at 5% level. This means that when the firm revenue increases by 1%, the loan size will increase by 1.056% holding other conditions constant. The second set of variables are macro-economic condition indicators. Although the deposit and loan interest rates have relatively large coefficient, 875.6 and negative 1,125 respectively, these two interest rates have remained around 0.5% and are fairly constant over the past few years. Public expenditure has a coefficient of 8.624, meaning 1% increase of public expenditure will stimulate an 8.624% increase of a firm’s loan size. This suggests as a possible explanation that the abnormal loan expenditure was driven by government policies.
Model Limitation

The models don’t capture the firm’s motivation for borrowing money, and this motivation could be correlated with the success of the loan, which would to omitted variables bias. Some firms may choose alternative financing methods instead of borrowing bank loan – but I am unable to control for companies that finance through the stock exchange. Second, there could also be omitted variable bias due to incomplete control of macro-economic figures. As I only have yearly data, any change in loans between years could be due to a wide range of factors, in particular macro-economic factors, so not being able to control for everything could be an issue.
Industry Type Results

The last issue I want to analyze is the heterogeneous effect of Basel III on firms in different industries. Various studies have analyzed the influence of the financial sector on a country’s economic growth. Bank-specific controls and regulations damage economic growth through decreasing capital-allocation efficiency and cutting down of lending (Kroszner et al. 2007; Dell’ Ariccia et al. 2008). However, the effect won’t be identical across industries. Therefore, I conducted sub regressions for 18 different industries and analyzed different effects between industry using the same fixed effect model. From the regression results in Table 7, we can see that the coefficients for Basel III completion are different among firms in different industries. Construction has highest significant coefficient, with the loan size increased by 4.8 times after Basel III was implemented in China, while Education was greatly negatively affected, having a coefficient of negative 26.6 for the Basel III variable. For most industries, such as Healthcare, Real Estate, and Transportation, the coefficients for Basel III are not significant. This indicates that the increase in loan sizes are driven mainly by firm’s revenue and economic conditions like GDP growth.
<table>
<thead>
<tr>
<th>Industry</th>
<th>Rental Industry</th>
<th>Others</th>
<th>Construction</th>
<th>Finance</th>
<th>Mining</th>
<th>Healthcare and Social Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>Real Estate</td>
<td>Utilities</td>
<td>Retail</td>
<td>IT</td>
<td>Scientific Research</td>
<td>Transportatio n &amp; Logistics</td>
</tr>
<tr>
<td>Coefficient of Basel III</td>
<td>2.307</td>
<td>2.588</td>
<td>2.066</td>
<td>2.150</td>
<td>0.174</td>
<td>2.903</td>
</tr>
<tr>
<td>Industry</td>
<td>Hospitality</td>
<td>Manufacturing</td>
<td>Water Environment and Public Facilities</td>
<td>Agriculture</td>
<td>Sports &amp; Entertainment</td>
<td>Education</td>
</tr>
<tr>
<td>Coefficient of Basel III</td>
<td>0.797</td>
<td>0.997*</td>
<td>0.390</td>
<td>-2.762</td>
<td>-2.657</td>
<td>-26.60</td>
</tr>
</tbody>
</table>
Conclusion

In contrast to my initial hypothesis, after Basel III was implemented in China, I find that the loan size actually increased after Basel III, by 192%, even when controlling for macro-economic factors, company financial factors and company specific fixed effects over time. There are two main explanations for this result. Firstly, this credit boom is mainly driven by central government’s targeted polices. Secondly, most Chinese banks were unaffected by Basel III’s credit restrictions because of their existing structure, and thus Basel III did not have the negative effect on lending that might have been expected.

I also find that Basel III did have a heterogeneous effect on the loan size of different industries, with some industries such as construction experiencing an increase in the loan size after Basel III was implemented and other industries such as education that experiencing a decrease.

After 2008 financial crisis, many scholars indicated that Chinese economy is supported by booming credit through large state-owned banks. Although credit is essential for economic growth, the credit-to-GDP ratio should remain relatively stable. However, after the 2008 financial crisis, the nonfinancial sector domestic credit-to-GDP ratio increased from 1.35 to 2.35 in 2016. Nowadays, the credit gap accounts for 25 percent of total domestic GDP. In addition to the size, the rapidly increasing debt also indicates a resource misallocation among different industries and provinces. As we can see in Table 7, the resources are concentrated in service industries, such as the finance and rental industry. Despite being emphasized in national level policies, industries that require large
amount of investment, including scientific research, education, agricultural, were neglected after 2009.

Past literature has pointed out that such a fast credit increase is abnormal and not sustainable. This is also associated with potential financial crisis or economic decrease. The interaction between credit increase and economic growth reflects public and governments’ perceptions of value and risk, in addition to their attitudes towards risk. These interactions can exaggerate economic growth and decline, increasing the chance of financial crisis. (Borio, 2012) In addition, empirical evidence demonstrates that the sharp increase of debt and asset ratios affects a country’s financial stability. Although credit increase is essential in the initial stage of economic expansion, constantly sharp increase of credit is used as a key predictor of financial crisis. In the past, the accumulation of credit both at firm and national level has harmed the demand in U.S., Europe (Eggertson and Krugman, 2010). This is especially important for Chinese economy, which is mainly investment driven in the late 90’s. Chinese government is dedicated to push the Chinese economy towards an upgrade from being investment driven to consumption driven. Besides completing the social welfare system, the large amount of credit is the biggest obstacle to a Chinese economic transformation.

The rapid credit growth is mainly driven by loose monetary policy and the industrial structure in the last decade (Chen and Kang, 2018). In their paper, they employed a standard time-series model of private credit determinants using data from 2008 to 2016. They found out that compared to the deposit rate with previous years, credit growth has a different growth direction from deposits. This opposite trend confirmed that policy
support played an important role in providing more credit and support the economy to achieve the high growth target of GDP. In addition, industrial structure has large impact on the excessive credit growth. After controlling for deposit growth and GDP growth, they found that credit was mainly concentrated in provinces relying on infrastructure investment and FAI investment, such as Heilongjiang, Liaoning, and Inner Mongolia. More credit was provided in these provinces indicating that industrial structure led to higher credit growth.
References


