



BACKGROUND PAPER

Differentiated Bank Regulation and Small and Medium-Sized Enterprises Financing

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DIFFERENTIATED BANK REGULATION AND SMALL AND MEDIUM-SIZED ENTERPRISES FINANCING

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Abstract

Using loan level data, this study examines how changes in regulation on nonperforming loan ratio affect bank lending to small and medium-sized enterprises (SMEs). Employing the difference-in-differences approach, we find that, after the implementation of a differentiated regulation on SMEs financing during 2011–2015, the credit to new client SMEs increased by 4.25%, the share of loans to SMEs of lower credit rating in the total loans increased by 1.13%, and the average size of loans to SMEs increase by 18.7%, which is accompanied by a 0.5% increase in nonperformance ratio for SMEs as well as a 2.5% increase in loan spread. This effect is more pronounced among state-owned banks and regions where bank competition level is lower. The findings indicate that novel policy instrument could alleviate credit constraints facing SMEs, and policy makers need to consider the fairness and sustainability of the policy impacts as well as tradeoff between financial stability and financial inclusion.

I. INTRODUCTION

Small and medium-sized enterprises (SMEs) financing has always been a challenging issue for policy makers, given its critical role for economic development and unique characteristics in tapping finance. In developing Asia, SMEs account for more than 96% of Asian businesses and create more than two-thirds of the jobs in the Asian economies (Yoshino and Taghizadeh-Hesary 2018). In addition, SMEs also help to mitigate negative external shocks and increase resilience of the economy via tax revenue, job creation, and support to the lower-income group in the economy. The important role of SMEs become more evident during the outbreak of the coronavirus disease (COVID-19) pandemic as many SMEs have financing difficulty to sustain businesses and maintain jobs. At the same time, the crisis tends to make bank lending to small businesses more expensive and difficult to obtain. According to Cortés et al. (2020), banks' small business experience less credit supply and higher borrowing costs as banks that are most affected by post-crisis stress tests allocate more credit towards safer borrowers. While various policy packages have been designed to support SMEs and low-income households in both advanced and emerging markets around the world, effective and innovative policies will contribute to a stronger SMEs sector and promote inclusive and sustainable growth.

Despite their importance to economic development, financing for SMEs has long been documented to be challenging. Existing literature has outlined several reasons that contribute to the difficulty and high costs of SME financing, including lack of quality collaterals (Chan and Kanatas 1985), severe information asymmetry (Stiglitz and Weiss 1981 and Williamson 1987), finance sector structure (Beck et al. 2008), and capacity of entrepreneurs (Gibson 1992). Among the reasons mentioned above, the first three are related to financial infrastructure and have the potential to be addressed by innovative regulation solutions.

Although capital markets in Asia have developed rapidly during the past decades, the Asian finance sector is still dominated by banks. Banks remain the key financial intermediation to channel savings to investments in the economy. Large companies have the option to tap capital markets for direct financing which requires greater transparency of information disclosure. For banks, large companies are not only more transparent but tend to have quality collaterals and borrow in a larger amount which lower monitoring costs and related risks. In contrast, SMEs do not have access to capital markets and do not

have reliable financial reports and collaterals, which require banks to monitor and observe constantly, which is costly and risky and naturally lead to a higher default rate of SMEs, and thus risk premium.

Many macroprudential regulations have further impeded the SMEs' access to finance. The implementation of Basel III focuses on capital sufficiency and emphasizes the role of risk management, which makes banks, especially smaller banks, more reluctant to lend to SMEs. The Financial Stability Board (2019) documents evidence that the regulatory constrain on capital sufficiency under Basel III has tightened the credit conditions and slowed the lending to SMEs from banks with weak capital positions in some markets. Fišera, Horváth, and Melecký (2019) examine the role of Basel III capital requirements on SME financing in emerging markets and find that, in the short term, the implementation of Basel III has a negative impact on SME financing. Bordo and Duca (2018) investigate the impact of the introduction of Dodd-Frank Act (DFA) on small business finance and find a significant decline in small business loans after the regulatory change because of a tighter bank credit standard. Ayyagari, Beck, and Martinez Peria (2017) examine companies operating in 59 global economies and show that adjustment in macroprudential regulations has a repressing impact on credit growth for businesses, especially for small companies that heavily rely on bank financing. They suggest a balancing between financial stability and financial deepening.

Given the importance of SMEs in terms of economic growth and employment, policy makers have made various efforts to improve SMEs' access to finance to improve their investment and performance, such as supporting micro credit programs, promoting fintech solutions. As the most important funding channel to SMEs, bank regulation remains an important policy instrument. The literature has examined the role of bank regulations in influencing SMEs' access to finance. For instance, Cahn, Duquerroy, and Mullins (2019) examine the effect of long-term refinancing operations program on bank lending to SMEs in France. They find that, because the long-term refinancing operations program lowers the required credit rating for eligible firms' loans to be used as collateral for the equity commercial bank, costs on SMEs loans declined and amount of SME credit increased for new newly eligible firms.

Cahn, Duquerroy, and Mullins (2019) offer a good example of using money and capital markets to implement bank regulation. However, in many emerging markets where capital and money markets are not yet developed enough to function such policy innovation, such policy instruments may not apply.

More innovative bank regulation will help to tackle this challenge. Mayordomo and Rodriguez-Moreno (2018) analyze the SME supporting factor that reduces banks' capital requirements for SME credit risk exposure in Europe, and show that the SME supporting factor increase the credit supply to medium-sized businesses but not for micro and small businesses. They suggest that banks are able to respond to the regulation changes and utilize the capital requirement to increase credit risk exposure in relative safer market.

This paper extends Cahn, Duquerroy, and Mullins (2019) and Mayordomo and Rodriguez-Moreno (2018) with new evidence on how an innovative differentiation bank regulation over SME nonperforming loan (NPL) performance will affect the lending to SMEs from a major emerging market: the People's Republic of China (PRC). This study utilizes the three consecutive changes in SME bank credit regulation during 2011 and 2015 to evaluate how differentiation in bank regulation over SME loans will guide banks' SME lending behavior.

Utilizing the difference-in-differences (DID) approach, this paper examined Jiangsu Province business loan data during 2011–2015. The finding is that, after the implementation of the differentiated regulation, controlling for various firm-specific, bank-specific, and macroeconomic factors, the share of loans to SME of low credit rating to total loans significantly increased by 1.1%–1.9%, new SME client increased by 3.8%–5.3%, and the average SME credit amount increased by 15.4%–18.5%. These evidences show that the changes in bank regulation over SME lending has significantly improved SMEs' access to finance. Moreover, the impact of change in regulation is more pronounced for large state-owned banks and in regions where bank competition is relatively less.

Meanwhile, the increased credit risk exposure is also reflected in higher loan costs and increased rate of SME NPLs. After the implementation of the new regulation, the NPL ratio for SME lending increased by 0.5% and the average SME loan cost increased by 2%–3.6%. Further tests indicate that banks profitability is weakened following the regulation. Such evidence implied increased credit risk exposure of banks when increasing lending to SMEs. Such evidence implied that shareholders of commercial banks are bearing the cost of generating this positive social externality. However, this will challenge the fairness of the policy as well as the sustainability of its impact. While it is important to improve SMEs' access to credit, policy makers need to tradeoff between financial stability and financial

inclusion. To support the lending to SMEs in emerging markets, more innovative and sustainable policy is needed.

The paper is organized as follows. Section II elaborates the institutional background of the regulation changes. Section III describes the data construction and research design. Section IV presents the results of how changes in policy affect the lending to SMEs. Section V provides additional tests on how bank profitability and risks are affected by the regulation. Section VI concludes the study.

II. BACKGROUND: DIFFERENTIATED BANK REGULATION ON SMALL AND MEDIUM-SIZED ENTERPRISES FINANCING IN THE PEOPLE'S REPUBLIC OF CHINA

Because of their small scale, less competitiveness, and weaker risk management capacity, SMEs are more susceptible to the macroeconomic fluctuations and business cycles compared with large and medium-sized enterprises, so the risk premium of financial services for SMEs. The average life of SMEs in the PRC is about 3 years, and only one-third of SMEs continue to operate after 3 years of establishment. The average life of SME in the United States is about 8 years, and 12 years in Japan. So the financial institutions in the PRC are facing higher risks in providing credit for SMEs. What is more, the governance structure, management, and financial system of SMEs are inferior compared with large and medium-sized enterprises. As a result, financial institutions cannot accurately identify the operation and financial status of the enterprise, and the cost of obtaining information for financial services is high. The operating costs and risks of SME loans are significantly higher than those of large and medium-sized enterprises loans. Without reliable management and risk control technology, the sustainability of large-scale SME loans provided by commercial banks will face challenges.

As commercial banks face the risk of supervision of regulatory agencies, the inclusion of SME loans in a unified risk assessment will affect the motivation of commercial banks to issue credit loans to SMEs. To solve this problem, the China Banking Regulatory Commission (CBRC) has tried to do innovation in regulatory policies to ease the financing difficulties of SMEs. On 25 April 2003, the CBRC was established. The CBRC has established (i) banking regulatory bureaus in 31 provinces and 5 separate cities in the PRC, and (ii) banking regulatory branches and supervisory offices at prefecture-level and

county-level cities to uniformly supervise banks and other deposit-taking financial institutions. For a long time, the CBRC has strictly controlled the NPL rate of enterprises.

The following is the detailed launching history of the innovated policy. On 25 May 2011, the CBRC issued the Notice of the China Banking Regulatory Commission on Supporting Commercial Banks to Further Improve Financial Services for Small Enterprises. The main content of the notice is as follows: “According to the risks, costs, and write-offs of SME loans by commercial banks, a differentiated assessment of the ratio of non-performing loans of SME shall be implemented, and the tolerance of the ratio of non-performing loans of SME shall be appropriately increased.” This is the first time that the CBRC has implemented differentiated regulatory assessments on loans to SMEs.

On 29 August 2013, the CBRC issued the Guiding on Providing better Financial Services to SMEs in 2015. The guiding shows that the NPL rate of SMEs is higher than that of all loans in banking financial institutions. If the NPL ratio of SME loan is within 2 percentage points compared with that of all loans, this indicator shall not be used as a deduction factor for the regulatory rating of the year. This is the CBRC's differentiated assessment of loans to SME from the perspective of the rating of the banking sector.

By the end of 2018, the national NPL rate of SMEs by financial institutions was 3.16%, and the NPL rate of SMEs with credit of less than CNY5 million was 5.5%, 1.83, and 4.17 percentage points higher than that of large enterprises, respectively. We try to evaluate the first implementation of the policy and explain its impact and mechanism.

III. DATA SOURCE AND EMPIRICAL STRATEGY

A. Data Source and Summary Statistics

Our data come from a corporate credit database that the China Banking and Insurance Regulatory Commission (CBIRC) Jiangsu Office established. With a population of 80.4 million in 2018 and an area of 102,600 square kilometers, Jiangsu is one of the most densely populated provinces in the PRC. Thanks to its large and well-developed manufacturing sector, it is one of the PRC's fastest-developing provinces over recent decades. As of 2018, Jiangsu had a gross domestic product (GDP) of US\$1.377 trillion

(CNY9.2 trillion), the second-highest in the PRC (just after Guangdong), but greater than those of Mexico and Indonesia. However, with an economic structure in which the secondary industry accounts for about 40% of GDP and home to many of the world's leading exporters of electronic equipment, chemicals, and textiles, Jiangsu faces serious environmental degradation.

This dataset contains about 1.3 million commercial loans that all banks operating in six prefectures within this province granted to all nonfinancial firms from 2010 to 2016, allowing us to identify the causal effect of environmental policy on the stability of the financial system by exploiting the variations across prefectures, banks, industries, and borrowing firms. Since the database includes all loans that the banks granted within the jurisdiction, we eliminate concerns about sample selection. Moreover, this coastal province offers an ideal setting in which to investigate how the process of adjustment toward a low-emission economy affects the financial risks because it has a diverse economy with various types of banks. On the one hand, the GDP per capita of the six prefectures varies widely between US\$7,000 and US\$20,000, representing different levels of economic development. On the other hand, various types of banks, such as the big five state-owned commercial banks, joint-equity commercial banks, foreign banks, city commercial banks, rural commercial banks, rural credit cooperative, are operating in these jurisdictions. According to the newest statistics released by CBIRC, the total asset of commercial banks in Jiangsu Province amounts to CNY16,781.52 billion (about US\$2,494 billion), accounting for 8% of the whole commercial banking industry in the country as of 2018.

The number of borrowers in this dataset amounts to about 100,000 firms, covering all industrial sectors following the classification defined by the Government of the PRC. Table 1 shows the basic descriptive statistical analysis of variables.

Table 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Nonperforming loan	435,545	0.012	0.110	0	1
Low-credit loan	212,770	0.354	0.478	0	1
New client	440,988	0.212	0.409	0	1
Loan amount (CNY10,000)	440,988	729	18,412	1	4,000,000
Lending spread	440,988	0.206	0.239	-0.200	2.946
Benchmark interest rate (%)	440,988	6.080	0.544	4.860	7.050
Short-term loan	440,988	0.916	0.277	0	1
Medium- to long-term loan	440,988	0.084	0.277	0	1
Secured loan	440,988	0.451	0.498	0	1
Fiduciary loan	440,988	0.017	0.128	0	1
Loan on guarantee	440,988	0.421	0.494	0	1
Pledged loan	440,988	0.068	0.252	0	1
Discount loan	440,988	0.044	0.204	0	1
Micro and small enterprises	440,988	0.846	0.361	0	1
Medium-sized enterprise	440,988	0.122	0.327	0	1
Big enterprise	440,988	0.032	0.176	0	1
Company age (year)	440,988	8.95	5.56	1	60
State-owned enterprise	440,988	0.010	0.098	0	1
Collective enterprise	440,988	0.010	0.100	0	1
Private enterprise	440,988	0.182	0.386	0	1
Limited liability enterprise	440,988	0.684	0.465	0	1
Incorporated enterprise	440,988	0.018	0.134	0	1
Joint venture enterprise	440,988	0.037	0.188	0	1
Foreign enterprise	440,988	0.040	0.195	0	1
Other enterprise	440,988	0.020	0.140	0	1
Big five	440,988	0.334	0.472	0	1
Joint-stock commercial banks	440,988	0.084	0.278	0	1
City commercial banks	440,988	0.112	0.315	0	1
Rural banks	440,988	0.470	0.499	0	1
Share of secondary industry	440,988	0.543	0.025	0.450	0.569
Share of tertiary industry	440,988	0.411	0.021	0.372	0.442
Gross domestic product per capita (CNY)	440,988	77,359	25,114	22,525	114,029

Source: Authors' calculation.

B. Empirical Strategy

In particular, we rely on the DID approach to infer the impact of regulation on SMEs' loan performance. DID analysis consists of comparing the pre-post difference in an outcome variable between a treatment and a control group. Specifically, for each loan, we classify SMEs loan as our treatment group, while the rest is the control group. We obtain our DID estimators measuring the effect of the regulation policy shock on the SMEs NPL using the following model:

$$y_{lbft} = \beta_0 + \beta_1 Policy_t + \beta_2 Policy_t * Treat_i + \beta_3 Treat_i + \beta_4 L_{lt} + \beta_5 F_{ft} + \varepsilon_{lbft}$$

The main outcome is the NPL l that bank b grants to f at time t . Define the substandard, suspicious, and loss in the five-level classification of bank loans as NPLs, with a value of 1, and 0 otherwise. Other dependent variables of concern include low-credit loans, new enterprise loans, loan amounts, and fluctuations in loan interest rates. To identify the policy effect, we need to impose a time window to ensure that the change in default or loan spread is indeed induced by the differentiation of bank regulation. Because of the differentiated banking regulatory policy formulation time is 25 May 2011, we divide our sample into two periods. We define the time between 25 May 2010 and 24 May 2011 as the before-policy adoption period (or pre-regulation period) and 25 May 2011 and 24 May 2012 as the after-treatment (post-regulation) period.

Accordingly, the dummy variable $Policy_t$, takes the value of 1 if a bank loan is granted during the post-regulation period, and 0 during the pre-regulation period. The other dummy variable, $Treat_i$ takes the value of 1 if a bank grants a loan to SMEs, and 0 otherwise. The interaction term between $Policy_t$ and $Treat_i$ is our main variable of interest. Its coefficient, β_2 , measures the difference in default or loan spread between the treatments (SMEs' loan) and the control group (non-SMEs' loan) after the implementation of the policy. In contrast, β_1 measures the difference between the post- and pre-regulation period for the control group, and β_3 measures the difference between the treatment and control group during the pre-period. Thus, the DID coefficient β_2 removes biases in the post-period comparison between the treatment and the control group that could be because of permanent differences between the control and the treatment groups, as well as biases resulting from comparisons over time in the treatment group that could be the result of trends. β_0 is a vector of fixed effects, and ε_{lbft} is the remainder

disturbance. L and F are vectors of loan and firm-year characteristics, respectively, that might affect the performance of loans. At the loan level, we control for the borrowing amount, which we measure as the logarithm of the absolute value, the maturity and the type of loans. We also control the characteristics of borrowers that might affect the loan spread and default probability of loans, including the firm age and ownership. At the prefecture-level, we control for regional macroeconomic variables, including the share of the secondary and tertiary industry in GDP, and real per capita GDP of the prefecture where a borrowing firm is located. At the same time, the impact of the central bank's benchmark interest rate is also considered.

A potential identification challenge of our DID estimation could be the presence of omitted variable bias resulting from other risk characteristics of banks and firms. Since a firm's loan performance might vary across industries banks and regions, we control the fixed effects of industry time bank and the prefecture where a borrowing firm is located. In addition, the time-varying supply-side policies of banks might drive the results. The fact that in our data every bank gives multiple loans within the sample period allows us to control bank*year fixed effects, which saturate the model from supply-side explanations of the findings. Considering demand-side potential omitted variables, the usual time-varying firm-specific characteristics mitigate such concerns. Considering some factors may vary across cities over time, we also add prefecture*year fixed effects to the specification to control for yearly city-specific shocks. Thus, along with the fielding of our model with firm year indicators of loan performance, it is unlikely that coefficient β_2 would capture anything other than a shift because of the policy exposure of SMEs vis-a-vis non-SMEs.

IV. EMPIRICAL RESULTS

A. Baseline Results

The main target of this policy is to increase the credit for SMEs. The target can be reached in two ways. First, banks could expand the coverage of SME credit. Second, banks could increase the fulfillment rate of SME credit needs.

So, in the following analysis, we estimate whether the implementation of the policy (i) extends credit to the SMEs that cannot access bank loans before the policy was enforced, (ii) extends credit to the SMEs of lower credit scores, and (iii) increase the amount of bank loans for SMEs. Tables 2, 3, and 4 report estimation results, respectively.

1. Loans to New Small and Medium-Sized Enterprises

Table 2 reports whether the implementation of the policy induces the banks to extend the credit to the SMEs which had been excluded by the banking sector. In all the specifications shown in Table 2, we control for the regional macroeconomic factors, the benchmark interest rate, and different types of fixed effects including prefecture, year, bank, prefecture-year, and bank-year fixed effects. The coefficient of the interaction term is positively significant, suggesting that, after the implementation of the policy, the ratio of loans granted to new SMEs increases by 3.76–5.31 percentage points.

Table 2: Differentiated Regulation and New Client Loan

Dependent variable: New client loan	(1)	(2)	(3)
Policy*treat	0.0425*** (0.0028)	0.0376*** (0.0029)	0.0531*** (0.0029)
Treat	0.0957*** (0.0019)	0.0983*** (0.0019)	0.0899*** (0.0019)
Policy	0.0183*** (0.0034)	0.0225*** (0.0034)	0.0095*** (0.0034)
Share of secondary industry	-3.9987*** (0.5417)	-1.8654** (0.8442)	5.4068*** (0.8344)
Share of tertiary industry	-10.9711*** (0.9303)	4.5939 (2.8760)	7.3892*** (1.3469)
Ln(GDP per capita)	-0.1498** (0.0597)	-0.2325 (0.1625)	-0.3842*** (0.0953)
Benchmark interest	0.0335*** (0.0044)	0.0326*** (0.0044)	0.0291*** (0.0044)
Year fixed effect	Y		
Prefecture fixed effect	Y		Y
Bank fixed effect	Y	Y	
Prefecture*year fixed effect		Y	
Bank*year fixed effect			Y
Observations	440,988	440,988	440,988
<i>R-squared</i>	0.125	0.126	0.129
<i>Adjusted R-squared</i>	0.125	0.125	0.129

GDP = gross domestic product, ln = natural logarithm, Y = yes.

Note: *** = significant at 10%, ** at 5% and * at 1%.

Source: Authors' estimates.

2. Loans to Small and Medium-Sized Enterprises of Low Creditworthiness

Table 3 reports whether the implementation of the policy let SMEs of lower credit get bank loans. In all the specifications shown in Table 3, we control for borrowing firms' characteristics, the regional macroeconomic factors, the benchmark interest rate, and different types of fixed effects similar to those in Table 2. The coefficient on our main variable of interest, the interaction term, is positively significant, suggesting that after the implementation of the policy, the ratio of low credit SME loan increase by 1.13–1.86 percentage points. This implies that the policy does increase the coverage of the SME bank loan.

For brevity, we note only the role of control variables that have the most significant effects on the ratio of low credit bank loan. The older company, non-state-owned enterprise (SOE) compared with SOE are related negatively to the ratio low credit loan.

Table 3: Differentiated Regulation and Low Credit Loan

Dependent variable: Low client loan	(1)	(2)	(3)
Policy*treat	0.0113*** (0.0032)	0.0186*** (0.0033)	0.0144*** (0.0033)
Treat	0.0601*** (0.0025)	0.0563*** (0.0025)	0.0585*** (0.0025)
Policy	0.0007 (0.0039)	-0.0046 (0.0039)	-0.0008 (0.0039)
Company age	-0.0028*** (0.0003)	-0.0028*** (0.0003)	-0.0029*** (0.0003)
Company age squared	0.0000*** (0.0000)	0.0000*** (0.0000)	0.0000*** (0.0000)
Collective enterprise	-0.0228*** (0.0082)	-0.0238*** (0.0082)	-0.0286*** (0.0082)
Private enterprise	0.0081 (0.0051)	0.0075 (0.0051)	0.0004 (0.0052)
Limited liability enterprise	-0.0144*** (0.0050)	-0.0148*** (0.0050)	-0.0220*** (0.0052)
Incorporated enterprise	-0.0401*** (0.0066)	-0.0407*** (0.0066)	-0.0474*** (0.0066)
Joint venture enterprise	-0.0258*** (0.0057)	-0.0266*** (0.0057)	-0.0335*** (0.0058)
Foreign enterprise	-0.0315*** (0.0056)	-0.0324*** (0.0056)	-0.0393*** (0.0057)
Other enterprise	-0.0018 (0.0071)	-0.0024 (0.0071)	-0.0054 (0.0071)
Share of secondary industry	-7.7304*** (0.7373)	9.3354*** (1.2372)	-6.4324*** (0.7461)
Share of tertiary industry	-8.5046*** (1.1910)	31.2647*** (4.2229)	-8.0211*** (1.1941)
Ln(GDP per capita)	0.8524*** (0.0778)	-1.5162*** (0.2393)	0.7900*** (0.0827)
Benchmark interest	0.0035 (0.0051)	0.0023 (0.0051)	0.0017 (0.0051)

Table 3 continuation

	Low credit loan		
	(1)	(2)	(3)
Industry fixed effect	Y	Y	Y
Year fixed effect	Y		
Prefecture fixed effect	Y		Y
Bank fixed effect	Y	Y	
Prefecture*year fixed effect		Y	
Bank*year fixed effect			Y
Observations	212770	212770	212770
<i>R-squared</i>	0.621	0.622	0.624
<i>Adjusted R-squared</i>	0.621	0.622	0.624

GDP = gross domestic product, ln = natural logarithm, Y = yes.

Note: *** = significant at 10%, ** at 5% and * at 1%.

Source: Authors' estimates.

3. Loan Amount

Table 4 reports whether the implementation of the policy helps the SMEs get a larger amount of bank loans. In all the specifications shown in Table 4, we control for loan and borrowing firms' characteristics, the regional macroeconomic factors, the benchmark interest rate, and different types of fixed effects similar to those in Table 2. The coefficient of the interaction term is positively significant, implying that, after the implementation of the policy, the average loan amount to SMEs increased. And from the coefficient of control variables, we can find that older companies and non-SOE compared with SOE get a smaller amount of bank loan, which is in line with our expectation. And the results shown in Table 2, Table 3, and Table 4 suggest that the policy does help SME better fulfill their financing needs.

Table 4: Differentiated Regulation and Loan Amount

Dependent variable: ln (loan amount)	(1)	(2)	(3)
Policy*treat	0.1867*** (0.0103)	0.1854*** (0.0103)	0.1538*** (0.0104)
Treat	-0.8866*** (0.0074)	-0.8861*** (0.0074)	-0.8677*** (0.0074)
Policy	-0.1515*** (0.0116)	-0.1503*** (0.0116)	-0.1207*** (0.0117)
Company age	-0.0195*** (0.0008)	-0.0195*** (0.0008)	-0.0195*** (0.0008)
Company age squared	0.0006*** (0.0000)	0.0006*** (0.0000)	0.0006*** (0.0000)
Collective enterprise	-0.7981*** (0.0258)	-0.7974*** (0.0258)	-0.7830*** (0.0258)
Private enterprise	-1.2584*** (0.0196)	-1.2577*** (0.0196)	-1.2464*** (0.0196)
Limited liability enterprise	-1.0107*** (0.0193)	-1.0101*** (0.0193)	-1.0004*** (0.0194)
Incorporated enterprise	-0.7585*** (0.0232)	-0.7574*** (0.0232)	-0.7503*** (0.0233)
Joint venture enterprise	-0.8695*** (0.0213)	-0.8692*** (0.0213)	-0.8584*** (0.0214)
Foreign enterprise	-1.0353*** (0.0214)	-1.0347*** (0.0214)	-1.0280*** (0.0215)
Other enterprise	-0.9713*** (0.0232)	-0.9706*** (0.0232)	-0.9594*** (0.0232)
Share of secondary industry	-7.5774*** (1.6040)	-9.9407*** (2.5395)	-15.9805*** (2.4451)
Share of tertiary industry	-16.3308*** (2.7972)	-21.7385*** (8.5729)	-19.0685*** (4.1131)
Ln(GDP per capita)	-0.3162* (0.1776)	1.9374*** (0.4882)	0.1306 (0.2744)
Benchmark interest	-0.1065*** (0.0129)	-0.1060*** (0.0129)	-0.1093*** (0.0130)

Table 4 continuation

Dependent variable: ln (loan amount)	(1)	(2)	(3)
Industry fixed effect	Y	Y	Y
Year fixed effect	Y		
Prefecture fixed effect	Y		Y
Bank fixed effect	Y	Y	
Prefecture*year fixed effect		Y	
Bank*year fixed effect			Y
Observations	440988	440988	440988
<i>R-squared</i>	0.297	0.297	0.301
<i>Adjusted R-squared</i>	0.296	0.297	0.301

GDP = gross domestic product, ln = natural logarithm, Y = yes.

Note: *** = significant at 10%, ** at 5% and * at 1%..

Source: Authors' estimates.

4. Nonperforming Loans

To understand the impact of the differentiated bank regulation (DBR) policy on bank performance, we first evaluate the impact of the DBR policy on NPLs of SME credit of banks during our sample period. The results are reported in Table 5.

All the specifications control for the loan and borrowing firms' characteristics, the regional macroeconomic factors, the benchmark interest rate, and different types of fixed effects. We control for the industry, prefecture, year, and bank fixed effects in the specification (1); the industry, prefecture-year, and bank-year fixed effects in the specification (2); the industry, prefecture, bank-year fixed effects in the specification (3). All 3 specifications show similar estimates and the results are consistent across different specifications. NPL is positively associated with loans with longer terms of maturity, fiduciary loan compares with the collateral loan, and collective enterprise and foreign enterprise compare with SOE. And it is negatively associated with loan-amount, company age. The coefficient for the interaction term between Policy and Treat is positively significant. The magnitude of the coefficient indicates that the probability of SME credit to become NPL rose by 0.43–0.62 percentage point after the policy implementation. Compared with the mean NPL rate of 1.2% for the whole sample, this is equivalent to a 35.8%–51.7% increase in the NPL rate.

Table 5: Differentiated Regulation and Nonperforming Loan

Dependent variable: NPL	(1)	(2)	(3)
Policy*treat	0.0054*** (0.0007)	0.0043*** (0.0008)	0.0062*** (0.0008)
Treat	-0.0017*** (0.0006)	-0.0012** (0.0006)	-0.0022*** (0.0006)
Policy	-0.0017* (0.0009)	-0.0008 (0.0009)	-0.0026*** (0.0009)
Ln(loan_amount)	-0.0017*** (0.0002)	-0.0017*** (0.0002)	-0.0016*** (0.0002)
Medium-to long-term loan	0.0097** (0.0009)	0.0096** (0.0009)	0.0107** (0.0009)
Fiduciary loan	0.0087*** (0.0020)	0.0092*** (0.0020)	0.0093*** (0.0020)
Loan on guarantee	-0.0043*** (0.0004)	-0.0044*** (0.0004)	-0.0044*** (0.0004)
Pledged loan	-0.0052*** (0.0007)	-0.0051*** (0.0007)	-0.0052*** (0.0007)
Discount loan	-0.0031*** (0.0009)	-0.0031*** (0.0009)	-0.0033*** (0.0009)
Company age	-0.0004*** (0.0001)	-0.0005*** (0.0001)	-0.0004*** (0.0001)
Company age squared	0.0000*** (0.0000)	0.0000*** (0.0000)	0.0000*** (0.0000)
Collective enterprise	0.0178*** (0.0030)	0.0180*** (0.0030)	0.0177*** (0.0030)
Private enterprise	-0.0007 (0.0017)	-0.0006 (0.0017)	-0.0007 (0.0017)
Limited liability enterprise	-0.0005 (0.0017)	-0.0004 (0.0017)	-0.0004 (0.0017)
Incorporated enterprise	0.0032 (0.0020)	0.0032 (0.0020)	0.0034* (0.0020)
Joint venture enterprise	-0.0013 (0.0017)	-0.0011 (0.0017)	-0.0011 (0.0017)
Foreign enterprise	0.0077*** (0.0018)	0.0079*** (0.0018)	0.0079*** (0.0019)

Table 5 continuation

Dependent variable: NPL	(1)	(2)	(3)
Other enterprise	-0.0028 (0.0020)	-0.0026 (0.0020)	-0.0028 (0.0020)
Share of secondary industry	0.4619*** (0.1750)	1.1529*** (0.2846)	0.1153 (0.1759)
Share of tertiary industry	-0.7141** (0.2951)	3.0363*** (0.9613)	-0.6756** (0.3064)
Ln(GDP per capita)	-0.1462*** (0.0197)	-0.2107*** (0.0548)	-0.1135*** (0.0181)
Benchmark interest	0.0063*** (0.0012)	0.0063*** (0.0012)	0.0060*** (0.0012)
Industry fixed effect	Y	Y	Y
Year fixed effect	Y		
Prefecture fixed effect	Y		Y
Bank fixed effect	Y	Y	
Prefecture*year fixed effect		Y	
Bank*year fixed effect			Y
Observations	435545	435545	435545
<i>R-squared</i>	0.023	0.024	0.026
<i>Adjusted R-squared</i>	0.023	0.023	0.026

GDP = gross domestic product, Ln = natural logarithm, NPL = nonperforming loan, Y = yes.

Note: *** = significant at 10%, ** at 5% and * at 1%..

Source: Authors' estimates.

5. Loan Spread

At the same time, facing such a considerable increase in the probability of NPL rate, we also hope to know whether the banks charge higher risk premiums after the implementation of the policy. We then report the baseline DID estimation results on the lending spread relative to the benchmark rate in Table 6. In all the specifications shown in Table 6, we control for loan and borrowing firms' characteristics, the regional macroeconomic factors, the benchmark interest rate, and different types of fixed effects similar to those in Table 2. The coefficient of the interaction term is positively significant, implying that, after the implementation of the policy, the lending spread to SMEs significantly increased by 2.0–3.6 percentage points, which is equivalent to 10%–18% of the mean lending spread. This implies that the banks have priced the potential risks associated with the implementation of the policy. However,

compared with the considerable increase in the NPL rate, the increase in the loan spread is insufficient. When it comes to the control variables, we can find that the loan spread is positively related with the smaller loan amount, longer terms of maturity, collective enterprise, private enterprises compared with SOE; while negatively related with company age, non-collateral loans compared with collateral loans, incorporated enterprise, joint venture enterprise, and foreign enterprise compared with SOE.

Table 6: Differentiated Regulation and Loan Spread

Dependent variable: Loan spread	(1)	(2)	(3)
Policy*treat	0.0250*** (0.0015)	0.0360*** (0.0015)	0.0203*** (0.0015)
Treat	0.0331*** (0.0013)	0.0274*** (0.0013)	0.0350*** (0.0013)
Policy	-0.0078*** (0.0019)	-0.0171*** (0.0018)	-0.0027 (0.0019)
Ln(loan_amount)	-0.0236*** (0.0003)	-0.0236*** (0.0003)	-0.0246*** (0.0003)
Medium-to long-term loan	0.0112*** (0.0011)	0.0118*** (0.0011)	0.0107*** (0.0011)
Fiduciary loan	-0.0607*** (0.0026)	-0.0616*** (0.0027)	-0.0588*** (0.0027)
Loan on guarantee	-0.1033*** (0.0006)	-0.1032*** (0.0006)	-0.1044*** (0.0006)
Pledged loan	-0.1175*** (0.0015)	-0.1175*** (0.0015)	-0.1155*** (0.0015)
Discount loan	-0.0560*** (0.0016)	-0.0563*** (0.0017)	-0.0485*** (0.0017)
Company age	-0.0032*** (0.0001)	-0.0031*** (0.0001)	-0.0031*** (0.0001)
Company age square	0.0001*** (0.0000)	0.0001*** (0.0000)	0.0001*** (0.0000)
Collective enterprise	0.0214*** (0.0035)	0.0201*** (0.0035)	0.0224*** (0.0034)
Private enterprise	0.0061** (0.0025)	0.0052** (0.0025)	0.0060** (0.0025)

Figure 6 continuation

Dependent variable: Loan spread	(1)	(2)	(3)
Limited liability enterprise	0.0035 (0.0025)	0.0026 (0.0025)	0.0028 (0.0025)
Incorporated enterprise	-0.0073** (0.0031)	-0.0081*** (0.0031)	-0.0077** (0.0030)
Joint venture enterprise	-0.0125*** (0.0027)	-0.0137*** (0.0028)	-0.0129*** (0.0027)
Foreign enterprise	-0.0231*** (0.0027)	-0.0244*** (0.0027)	-0.0246*** (0.0027)
Other enterprise	0.0047 (0.0032)	0.0037 (0.0032)	0.0030 (0.0031)
Share of secondary industry	-1.3779*** (0.2786)	6.0280*** (0.4462)	2.9991*** (0.3703)
Share of tertiary industry	-2.2577*** (0.4538)	22.7066*** (1.5129)	3.8538*** (0.6388)
Ln(GDP per capita)	0.0253 (0.0293)	-1.3167*** (0.0862)	-0.4581*** (0.0315)
Benchmark interest	0.0368*** (0.0022)	0.0376*** (0.0022)	0.0407*** (0.0022)
Industry fixed effect	Y	Y	Y
Year fixed effect	Y		
Prefecture fixed effect	Y		Y
Bank fixed effect	Y	Y	
Prefecture*year fixed effect		Y	
Bank*year fixed effect			Y
Observations	440988	440988	440988
<i>R-squared</i>	0.474	0.478	0.496
Adjusted <i>R-squared</i>	0.474	0.478	0.496

GDP = gross domestic product, Ln = natural logarithm, NPL = nonperforming loan, Y = yes.

Note: *** = significant at 10%, ** at 5% and * at 1%..

Source: Authors' estimates.

B. Cross-sectional Variations

The baseline results show the average effect of the DBR policy on loans to new SME clients, SMEs of low creditworthiness, size of loan to SMEs, NPLs of SME loans, and the loan spread. The DBR policy may change the bank's behavior in other ways. Banks of different sizes may have different capacities for risk management. Banks in a different region facing different levels of competition. Simply focusing on the average value would conceal the changes in SME NPLs, low credit SME loan ratio, new client SME loan ratio, SME bank loan amount, and the loan spread of different components of loan portfolios. The detailed structure of our bank data enables us to do further investigation. We now explore whether the relationship uncovered in Tables 2–6 varies cross-sectionally along certain observable dimensions.

1. Bank Size

Considering that different banks may price the DBR policy differently, we divide all the banks into two groups according to their size and ownership. One group contains the five biggest state-owned commercial banks: the Bank of China, the China Construction Bank, the Industrial and Commercial Bank of China, the Agricultural Bank of China, and the Bank of Communications. The other group includes joint-equity commercial banks and local banks (rural commercial banks and city commercial banks). We interact with the bank type dummy with the original DID term and implement DDD analysis. The results that Table 7 reports show that, compared with other banks, the big five banks have a higher SME NPL ratio, low credit SME loan ratio, new client SME loan ratio, and lower SME loan amount and loan spread following the implementation of the policy. This might imply that the big five banks would promote the policy with less profit requirement even some loss in the short term.

Table 7: Differentiated regulation, Small and Medium-Sized Enterprises loan by bank size

	NPL	Low credit loan	New client	Ln(loan amount)	Loan spread
	(1)	(2)	(3)	(4)	(5)
Policy*treat*big five	0.0027*** (0.0007)	0.0534*** (0.0028)	0.0245*** (0.0027)	-0.1573*** (0.0079)	-0.0528*** (0.0011)
Policy*treat	0.0045*** (0.0008)	-0.0250*** (0.0037)	0.0349*** (0.0029)	0.2358*** (0.0103)	0.0416*** (0.0016)
Treat	-0.0020*** (0.0006)	0.0601*** (0.0025)	0.0933*** (0.0019)	-0.8713*** (0.0074)	0.0380*** (0.0013)
Policy	-0.0016* (0.0009)	0.0010 (0.0039)	0.0191*** (0.0034)	-0.1566*** (0.0116)	-0.0097*** (0.0019)
Industry fixed effect	Y	Y		Y	Y
Year fixed effect	Y	Y	Y	Y	Y
Prefecture fixed effect	Y	Y	Y	Y	Y
Bank fixed effect	Y	Y	Y	Y	Y
Observations	435545	212770	440988	440988	440988
<i>R-squared</i>	0.023	0.622	0.092	0.297	0.476
<i>Adjusted R-squared</i>	0.023	0.622	0.092	0.297	0.476

Ln = natural logarithm, NPL = nonperforming loan, Y = yes.

Note: *** = significant at 10%, ** at 5% and * at 1%..

Source: Authors' estimates.

2. City Heterogeneity

Although the DBR policy was a nationwide policy, the competency of banks in different regions varied greatly. So the policy may have a different impact on banks in different regions. We calculate an Herfindahl–Hirschman Index (HHI) based on the credit amount of each bank of the region to evaluate the fierce competition of that prefecture. We denote the two prefectures with the highest HHI as regions of high competition, and then interact it with the DID term. The DDD estimation results that Table 8 reports show that the SME lending amount is larger in high compete region, and the new client SME ratio and loan spread are higher in low compete region.

Table 8: Differentiated Regulation, Small and Medium-Sized Enterprises Loan by City Bank Competition

	NPL	Low credit loan	New client	Ln(loan amount)	Loan spread
	(1)	(2)	(3)	(4)	(5)
Policy*treat*high- compete	0.0011 (0.0008)	-0.0034 (0.0034)	-0.0337*** (0.0030)	0.0351*** (0.0084)	-0.0237*** (0.0013)
Policy*treat	0.0047*** (0.0009)	0.0135*** (0.0041)	0.0632*** (0.0034)	0.1652*** (0.0116)	0.0395*** (0.0018)
Treat	-0.0017*** (0.0006)	0.0601*** (0.0025)	0.0957*** (0.0019)	-0.8866*** (0.0074)	0.0331*** (0.0013)
Policy	-0.0017* (0.0009)	0.0008 (0.0039)	0.0186*** (0.0034)	-0.1517*** (0.0116)	-0.0076*** (0.0018)
Industry fixed effect	Y	Y		Y	Y
Year fixed effect	Y	Y	Y	Y	Y
Prefecture fixed effect	Y	Y	Y	Y	Y
Bank fixed effect	Y	Y	Y	Y	Y
Observations	435545	212770	440988	440988	440988
<i>R-squared</i>	0.023	0.621	0.092	0.297	0.474
<i>Adjusted R-squared</i>	0.022	0.621	0.092	0.296	0.474

Ln = natural logarithm, NPL = nonperforming loan, Y = yes.

Note: *** = significant at 10%, ** at 5% and * at 1%.

Source: Authors' estimates.

C. Further Analysis: Bank Performance

To get a better understanding, we try to analyze the impact of SME credit on bank performance. We collect financial data of 30 most important banks and some SME credit institutions in the PRC. These 30 banks are all public banks, including the big five banks, 13 joint-equity commercial banks, and 12 city commercial banks. The summary statistics of the variables in the dataset for the sample period running from 2012 to 2018 are shown in Table 9.

Table 9: Summary Statistics at the Bank Level

Variable	Obs	Mean	Std. Dev.	Min	Max
Return on assets	130	0.012	0.003	0.004	0.019
Return on equity	130	0.175	0.046	0.051	0.281
Proportion of loans to SMEs	130	0.219	0.134	0.021	0.606
Total asset (CNY100 million)	130	57734	72162	66	276995
Proportion of owner's equity	130	0.067	0.010	0.048	0.108
LDR	130	0.727	0.133	0.390	1.100

Obs = number of observations, Std. Dev. = standard deviation, Min. = minimum, Max. = maximum, SMEs = small and medium-sized enterprises, LDR = loan-to-deposit ratio.

Source: Authors' estimates.

Table 10 reports the result of the panel fixed-effect analysis. The result indicates that the proportion of SME credit has a negative relationship with bank performance. If the SME credit ratio increase to 10%, the return on assets and return on equity of the bank will decrease by 0.1% and 1.5%, respectively. So, the implementation of the DBR policy would not only increase the risk of banks but also deteriorate their performance.

Table 10: Proportion of Loans to Small and Medium-Sized Enterprises and Bank Performance

	(1) FE ROA	(2) FE ROE
L1. Proportion of loans to SMEs	-0.0091** (0.0037)	-0.1524** (0.0651)
L1.log(total asset)	0.0006 (0.0012)	-0.0022 (0.0206)
L1. Proportion of owner's equity	0.0294 (0.0219)	0.2382 (0.3820)
L1. LDR	-0.0035 (0.0025)	-0.0656 (0.0438)
Observations	130	130
R-squared	0.7388	0.8415
Number of Bank	30	30

FE =fixed effect model, LDR = loan-to-deposit ratio, ROA = return on assets, ROE = return on equity, SMEs = small and medium-sized enterprises.

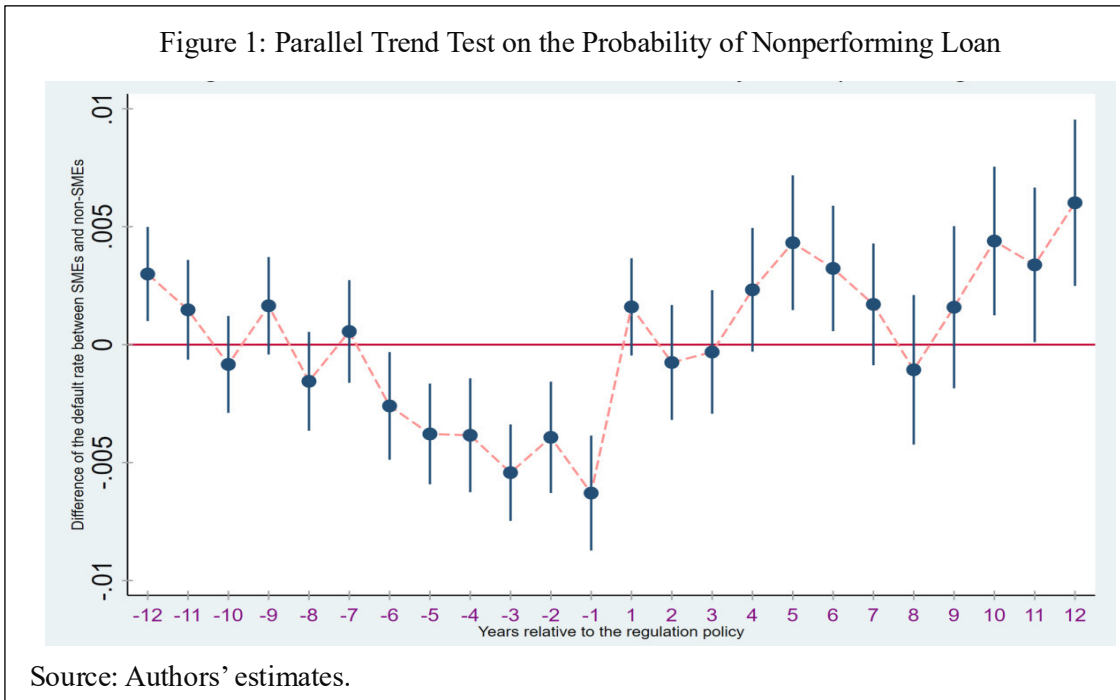
Note: *** = significant at 10%, ** at 5% and * at 1%..

Source: Authors' estimates.

V. ROBUSTNESS CHECK

In this section, we conduct further several robustness tests on our baseline results by implementing the parallel trend analysis and using different sample periods.

The DID analysis is based on the assumption of parallel trend. Figure 1 plots the impact of regulation policy. We consider a 24-month window, spanning from 12 months before the regulation policy was implemented until 12 months after it was enforced. We control industry year, bank, and prefecture fixed effect. Before the policy implementation, the default rate of SMEs was either indifferent or even lower than that of non-SMEs, indicating DID is the appropriate approach for this research.



Considering a bank may have negotiated the loan contract just before the implementation of the policy, there might be some delay for the policy to take effect. Meanwhile, the policy also might have some impact before it comes into force. So, to mitigate these possible impacts, we drop samples that fall in the period within 3 months before or after the policy implementation date (from 25 February 2011 to 24 August 2011). We re-estimate the baseline DID analysis using the new dataset. The results are reported in Table 11. All the estimates are in line with the baseline results. After the policy implementation, the

SME NPL ratio, low credit SME loan ratio, new client SME loan ratio, SME loan amount, and SME loan spread all significantly increased.

Table 11: Drop Sample in Three Months Before and After Policy Implementation

	NPL	Low credit loan	New client	Ln(loan amount)	Loan spread
	(1)	(2)	(3)	(4)	(5)
Policy*treat	0.0042*** (0.0009)	0.0129*** (0.0047)	0.0407*** (0.0042)	0.2563*** (0.0154)	0.0319*** (0.0021)
Treat	-0.0004 (0.0007)	0.0542*** (0.0031)	0.0932*** (0.0024)	-0.8886*** (0.0095)	0.0300*** (0.0016)
Policy	0.0022 (0.0018)	0.0068 (0.0078)	-0.0136** (0.0068)	-0.3003*** (0.0230)	0.0047 (0.0036)
Industry fixed effect	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y
Prefecture fixed effect	Y	Y	Y	Y	Y
Bank fixed effect	Y	Y	Y	Y	Y
Observations	301611	104964	215712	215712	215712
<i>R squared</i>	0.024	0.614	0.096	0.303	0.484
<i>Adjusted R squared</i>	0.024	0.614	0.096	0.303	0.484

NPL = nonperforming loan, Y= yes.

Note: *** = significant at 10%, ** at 5% and * at 1%.

Source: Authors' estimates.

B. Robustness Check with Samples of the Year 2011

Every year, there are various monetary policies related to the credit market which might impact our estimation result. So, to minimize the impact of these related policies, we confine the sample within the year 2011 (from 1 January 2011 to 31 December 2011) and re-estimate the baseline DID analysis. The findings are still in line with the baseline results.

Table 12: Keep Sample between 1 January 2011 and 31 December 2011

	NPL	Low credit loan	New client	Ln(loan amount)	Loan spread
	(1)	(2)	(3)	(4)	(5)
Policy*treat	0.0075*** (0.0010)	0.0078* (0.0047)	0.0517*** (0.0041)	0.1789*** (0.0142)	0.0214*** (0.0024)
Treat	-0.0043*** (0.0009)	0.0700*** (0.0039)	0.0885*** (0.0031)	-0.8803*** (0.0110)	0.0318*** (0.0022)
Policy	-0.0048*** (0.0011)	0.0056 (0.0050)	0.0192*** (0.0043)	-0.1181*** (0.0148)	-0.0069*** (0.0025)
Industry fixed effect	Y	Y	Y	Y	Y
Year fixed effect	Y	Y	Y	Y	Y
Prefecture fixed effect	Y	Y	Y	Y	Y
Bank fixed effect	Y	Y	Y	Y	Y
Observations	228576	110011	230985	230985	230985
<i>R-squared</i>	0.024	0.628	0.082	0.295	0.464
<i>Adjusted R-squared</i>	0.024	0.628	0.081	0.295	0.464

NPL = nonperforming loan, Y= yes.

Note: *** = significant at 10%, ** at 5% and * at 1%.

Source: Authors' estimates.

VI. CONCLUSION

This paper examined the impact of differentiation in bank regulation over SME lending on SME financing in the PRC. Complementing to Mayordomo and Rodriguez-Moreno (2018) that examine how lowering capital requirements for SME lending will direct more lending to SMEs, this paper presents novel evidence on how differentiation in the assessment of NPL ratio for SME loans will influence the SME lending. Thus, this paper contributes to the scarce literature on bank regulation on SME financing, which offers useful policy implications on how to improve financial deepening and tradeoff between financial stability and financial inclusion.

Using loan-level data and DID methodology, this paper analyzes how the implementation of differentiation requirement on SME NPLs affect SME lending. The key findings indicate that, after the implementation of the regulation, lending to SMEs improved as evidenced by increases in the ratio of SME lending to total lending, new SME clients, and the average size of SME loans. At the same time, the credit quality of SME lending declined, with a higher NPL ratio for SMEs and a higher SME loan interest rate. In addition, such impact is stronger among state-owned banks and in regions with weaker bank competition.

Further examination is conducted to see the implications of change in bank regulation on bank profitability and risks. It is shown that, after the implementation of the regulation, banks profitability declined and risks increased. Such evidence suggests that the positive externality of enhanced SME finance comes at the cost of weakening the fundamentals of the banking sector. This will challenge the sustainability of such impact as shareholders of banks are paying for the positive social externality. In addition, weakened fundamentals of the banking sector also challenge financial stability.

Overall, while empirical evidence on the consequences of bank regulation's influence on SME finance are still limited, this paper provides direct and novel evidence on how changes in requirements on SME NPLs will affect SME lending. From a policy maker's perspective, understanding the consequences of such policy is important as it is not only related to financial inclusion and economic development, but also matters for fairness and financial stability. More regulation innovation is called to fix the market failure in SME financing without harming financial stability and causing unfairness.

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