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Financial Crises, Bank Lending, and Trade Credit:

Evidence from Chinese Enterprises

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Abstract

Using Chinese firm-level data from 2006~2014—which includes the period of the recent financial crisis—we test whether firms, particularly small and medium enterprises (SMEs) that are financially constrained, are more likely to use or depend on trade credit. We also compare enterprises by ownership structure to determine which type of enterprises use trade credit more than bank loans. We then study the effect of the financial crisis of 2008 to observe whether firms increased their use of trade credit right after the crisis. We expect SMEs that are financially constrained to depend more on trade credit during the financial crisis. This may suggest the existence of a substitution relationship between bank loans and trade credit in conditions where enterprises are highly constrained financially or during periods of financial crisis.

Keywords: Financial Crises, trade credit, bank loans, Chinese industrial enterprises,SMEs

JEL Classification: D22 D24 G32

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1 Introduction

Trade credit is a useful financial resource for enterprises, particularly for SMEs in China[3]. But what is the relationship between trade credit and bank loans? When enterprises are unable to obtain external financing from banks, will they increase trade credit with their business partners? Or, if they are unable to obtain bank loans, will they also have difficulty in obtaining trade credit? Alternatively, are enterprises obtaining financing from banks and simultaneously extending trade credit? There are many theoretical explanations concerning trade credit. This paper focuses on the relationship between trade credit and formal financing channels. We observe the period of the recent financial crisis of 2008, and also focus on the changes in the use of bank loans and trade credit using before and after the Lehman Brothers shock.

This study begins with a general survey of the literature on substitution hypotheses for trade credit and bank loans. Trade credit may provide better access to capital for firms than formal financial channels. In this case, it can be said that trade credit and bank loans have a substitute relationship, in particular for firms with weak banking relationships (Petersen and Rajan (1997)). Danielson and Scott (2004) provide evidence that firms will increase their reliance on trade credit when banks do not provide loans. Niskanen, J. and Niskanen, M. (2006) find that larger and older firms, and firms with strong internal financing sources, have a lower propensity to use trade credit, but that small firms and younger medium-sized firms with high growth rates tend to rely more heavily on trade credit. Guariglia and Matent (2006) use a panel of UK firms to test whether the trade credit channel offsets the credit channel. They find that both trade credit and credit are being used, and they also test as well as firms' coverage ratios, but find they do not affect inventory investments that are made using trade credit. Their results are consistent with Kaplan and Zingales (1997) and Cleary (1999). Bougheas, Mateut, and Mizen (2009) examine a ten-year dataset of UK industrial firms. They find that short-term bank loans have a direct negative effect on trade credit. Molina and Preve (2012) analyze how financial distress affects firms' decisions to use trade credit with their suppliers. Their results show that firms in financial distress will use trade credit more frequently with their suppliers, which is expensive and adds to their costs of financial distress.

Next, this study examines whether firms can obtain loans from banks while also

[3] See Ge and Qiu (2007), which describes the reality of trade credit in China.

using trade credit: In other words, whether the two modes have a complementary relationship.

Cook (1999) analyzes data from a survey of 352 firms in Russia, and finds that firms who use trade credit also have a higher probability of obtaining bank credit. Giannetti, Burkart, and Ellingsen (2011) analyze trade credit to develop the characteristics and aspects of bank-firm relationships. They find that trade credit is most likely facilitated by uninformed lenders, and firms prefer to accept cheaper trade credit for longer periods. They also conclude that suppliers prefer short-term contracts in order to give incentives (for example, providing discounts, giving a low cost contract) to firms. This finding also provides insight about the asymmetric information between banks and firms, which can be alleviated by trade credit by incorporating into the lending relationship private information held by suppliers about the firms' customers. This is also consistent with Biais and Gollier (1997).

There are also other theoretical explanations about the substitution and complementation hypothesis between trade credit and bank loans. Gana, Mateus, and Teixeira (2008) use a panel dataset of Portuguese and Spanish SMEs to test the hypothesis of whether trade credit could be a substitute or a complementary resource to bank credit. They find that trade credit complements bank credit. Further, they show that younger and smaller firms have a greater tendency to access more credit, because trade credit makes private information about suppliers available to banks, which allows banks to have more intelligence about their customers, which in turn helps them make their credit decisions. However, they also point out that although the substitution effect is proven by their dataset, the substitution and complementation hypothesis will be different based on firms' attributes. Alphonse, Ducret, and Séverin (2006) test whether bank debt and trade credit exist as two complementary sources of financing. Their results show that trade credit and bank debt have a negative correlation in accordance with the substitution hypothesis. This is also consistent with Berger and Udell (1998). But their results also prove that trade credit can signal the quality of a firm, and this may help it obtain more bank loans.

In addition, Love, Preve, and Sarria-Allende (2007) discuss the effects of financial crises on trade credit. They find that firms increase their use of trade credit right after a financial crisis in order to delay their repayment periods. But this trend declines in the two years following the crisis. The reason may be associated with trade credit suppliers who are unable to obtain loans from banks as a result of the crisis. They suggest that more attention should be paid to the "redistribution view" of the supplier of trade credit, rather than conducting a simple analysis of substitution

and complementation hypothesis between trade credit and bank loans. Fisman and Love (2003) use data for 37 industries in 43 countries to estimate each industry's dependence on external finance. They find that industries are more dependent on trade credit in countries where financial institutions are less developed.

Finally, there are studies on trade credit in China. Brandt and Zhu (2000) examine three features of China's economic reform, namely economic decentralization, the government's commitment to the state sector, and the credit plan and credit control. They note that the Chinese government helps inefficient state firms by providing them with cheap credit. They also show that when the government continues to support inefficient state enterprises, these enterprises become weak, which leads to an inflation problem. Cull and Xu (2003) discuss the determinants of the distribution of credit, which is provided by state owned banks to state owned enterprises. They find a positive relationship between bank financing and the profitability of state owned enterprises. They also show that from the 1980s to the 1990s, this relationship weakened because state owned enterprises used bank credit instead of getting direct support from the government. Franklin (2005) provides a comparison between formal and non-formal financing approaches of state owned firms and non-state owned firms in China, concluding that non-formal financing approaches sustain the growth of non-state owned firms in China. Ge and Qiu (2007) focus on non-state owned firms in China, particularly those with limited support from banks. By comparing the use of trade credit by state owned firms and non-state owned firms in China, they find that the latter use trade credit more often. This suggests that non-formal financing channels support the growth of non-state firms. Cull, Xu, and Zhu (2009) use a large dataset of Chinese industrial firms and show that unprofitable state owned firms are more likely to obtain formal credit, despite their poor performance. These state owned firms may then provide trade credit to their customers who are unable to access formal credit or bank loans. The authors also point out that a biased and inefficient banking system may be the main reason for the increased substitution of trade credit. However, they do not find strong evidence that trade credit has a significant impact on the growth of China's enterprises.

Building on these studies about the substitution and complementation hypothesis between trade credit and bank loans, this paper offers the advantage of using firms' panel data for China. This study also contributes to the literature by dividing the analysis by trade credit supplier and trade credit demander. These groups are then applied to estimate the relationship between using trade credit and using financial institutions. Finally, this research also conducts a time series analysis over a nine-year

period to focus on the how the firms change their use of bank loans and trade credit before and after the financial crisis.

The remainder of this paper proceeds as follows. Section 2 presents the data and the basic information about the panel data. Section 3 discusses the empirical evidence of testing the substitution and complementation hypothesis between trade credit and bank loans. Section 4 presents the conclusions and the implications of these results, along with some ideas for future research.

2 Data and summary statistics

This dataset is from Orbis, which is provided by Bureau van Dijk Enterprise of statistics of Japan. We selected the sampling period from 2006 to 2014, which covers the years before and after the Lehman Brothers shock. The dataset provides industrial enterprise surveys covering Chinese state owned firms and non-state owned firms. This paper uses the enterprise data from the central area of China[4], with a total number of key variables of around 40,000.

Table 1 provides the definitions of the key variables used in this paper. The dependent variable is trade credit. Accounts payable and accounts receivable are used to represent trade credit, and these trade credit values are divided by the groups of suppliers and demanders, respectively. Thus, the accounts payable variable represents the demanders of trade credit (i.e. the firm's customers), while the accounts receivable variable represents the suppliers of trade credit to the firm. Bank loans are used to represent loans form banks. Moreover, in order to avoid economies of scale, the ratio of all dependent variables and bank loan is taken over total assets.

In order to examine the effect of the firm's size and ownership structure on the relationship of financial sources, dummy variable groups are created. First, the definitions for industry firm size used by the State Statistics Bureau of China (SSBC) 2011 are introduced—small, medium and large[5]. Second, the classification of industry firm ownership is divided into the following five groups[6]—state owned

[4] The central area concludes the provinces of Henan, Hubei and Hunan.

[5] The definitions for industry firm size used by the State Statistics Bureau of China (SSBC) 2011 are presented, as follows:

Small : 3 million yuan <= sales < 20 million yuan, and employees < 300

Medium: 20 million yuan <= sales < 400 million yuan, and 300 <= employees < 1,000

Large : sales >= 400 million yuan, and employees >= 1,000

[6] There are 7 ownership groups in the 2006 definitions of SSBC: State-owned Enterprise, Collectively Owned Enterprise, Private Enterprise, Joint Economy, Share Holding Economy, Economy Funded by Foreign Entrepreneurs & Entrepreneurs from Hong Kong, Macao and Taiwan, and Others. In order to facilitate the data analysis, the 7 groups were reduced to 5, merging Joint Economy and

enterprise, collectively owned enterprise, private enterprise, joint economy and share holding enterprise, and economy funded by foreign entrepreneurs & entrepreneurs from Hong Kong, Macao and Taiwan.

Table 1 Definition of variables

Variables	Description
Payable_totalassetsl_ratio	dependent variable = account payable / total assets
Receiveble_totalassets_ratio	dependent variable = account receivable / total assets
Bankloan_totalassets_ratio	= bank loan/total assets
ln_scale	= log (capital)
ln_workers	= log (num of workers)
ln_totalassets	= log (total assets)
ln_stock	= log (stock)
Interest rate	= (interest expenses / total debts)
Bankloans of small_firm	Dummy varible = bankloan_totalassets_ratio × small firm size dummy
Bankloansof medium_firm	Dummy varible = bankloan_totalassets_ratio × meduim firm size dummy
Bankloans of large_firm	Dummy varible = bankloan_totalassets_ratio × large firm size dummy
Bankloans of state owned enterprises	Dummy varible = bankloan_totalassets_ratio × state owned enterprises firm dummy
Bankloans of collectively owned enterprises	Dummy varible = bankloan_totalassets_ratio × collectively owned enterprises firm dummy
Bankloans of private enterprises	Dummy varible = bankloan_totalassets_ratio × private enterprises enterprises firm dummy
Bankloans of joint & share holding enterprises	Dummy varible = bankloan_totalassets_ratio × joint & share holding enterprises firm dummy
Bankloans of foreign enterprises	Dummy varible = bankloan_totalassets_ratio × foreign enterprises firm dummy
D_2006	Dummy varible for the year 2006
D_2007	Dummy varible for the year 2007
D_2008	Dummy varible for the year 2008
D_2009	Dummy varible for the year 2009
D_2010	Dummy varible for the year 2010
D_2011	Dummy varible for the year 2011
D_2012	Dummy varible for the year 2012
D_2013	Dummy varible for the year 2013
D_2014	Dummy varible for the year 2014

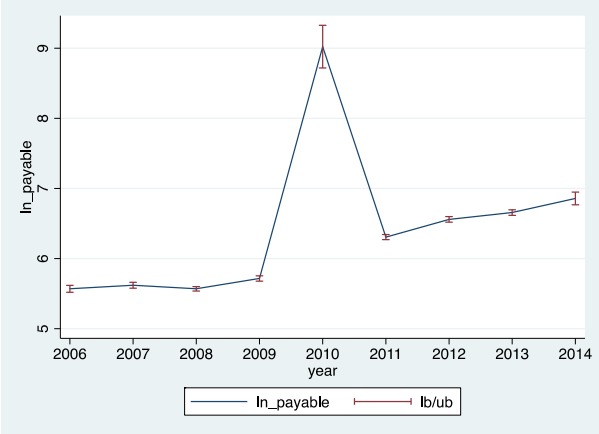
Note: Accounts payable and accounts receivable are used to represent trade credit, and bank loans are used to represent loans from banks.

Table 2 Means of dependent and independent variables, by year.

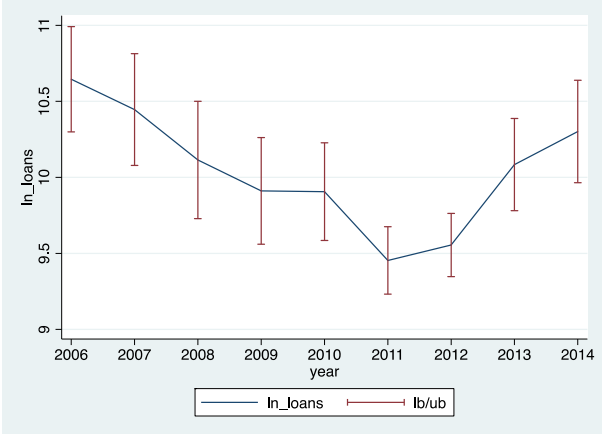
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Payable_totalassetsl_ratio	0.114	0.113	0.112	0.106	0.167	0.110	0.098	0.091	0.102
Receiveble_totalassets_ratio	0.131	0.130	0.124	0.125	0.133	0.121	0.124	0.120	0.137
Bankloan_totalassets_ratio	6.558	6.205	6.184	5.850	5.436	4.184	5.742	6.404	6.862
ln_scale	6.537	6.658	6.724	6.771	6.798	6.237	6.421	6.546	7.659
ln_workers	4.931	4.844	4.697	4.759	4.727	5.776	5.688	5.686	5.168
ln_totalassets	7.949	8.099	8.100	8.242	8.319	8.851	9.123	9.337	9.421
ln_stock	5.612	5.682	5.632	5.644	5.683	6.112	6.302	6.422	6.607
Interest rate	0.166	0.181	0.181	0.146	-0.161	0.251	0.264	0.260	5.242

Note: Table 2 shows the means of dependent and independent variables by years, which are definite in the Table 1.

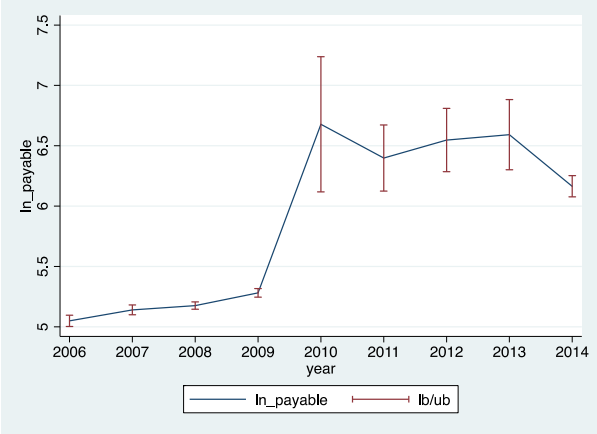
Share Holding Economy, and dropping the Others group because the database had very few data points in this group.



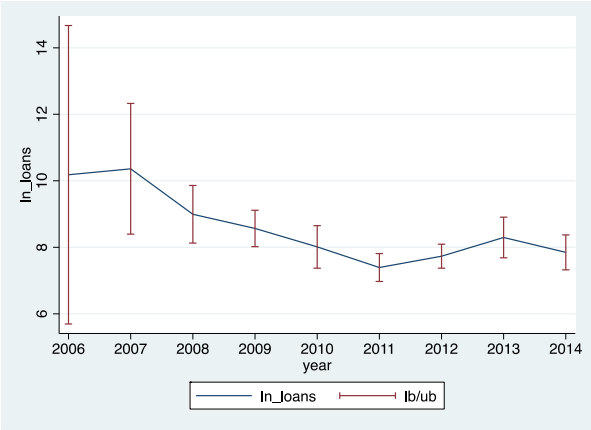
Panel A: Accounts payables for all firms



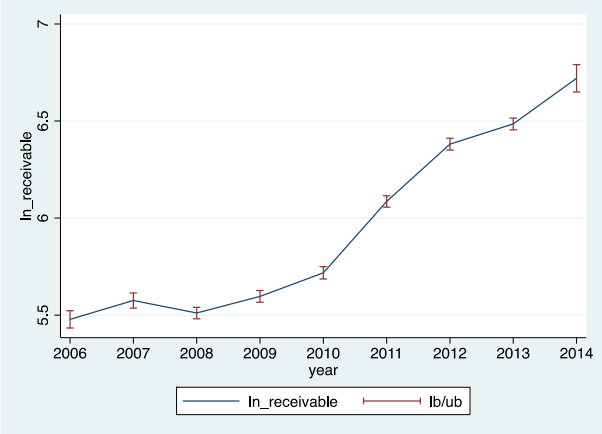
Bank loans for all firms



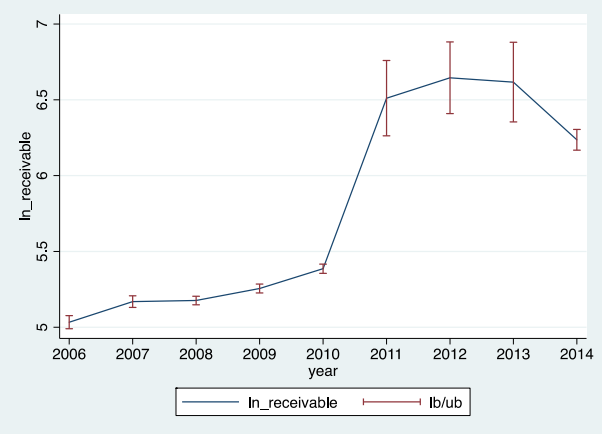
Panel B: Accounts payables for SMEs



Bank loans for SMEs



Panel C: Accounts receivables for all firms



Accounts receivables for SMEs

Figure 1. Growth of trade credit and bank loans for enterprises. ln_payable=ln (accounts payables), ln_loans =ln (bank loans) and ln_recevible=ln (accounts recevibles).

Figure 1 displays the variation in trade credit from 2006~2014, Panel A shows the situation of trade credit and bank loans for all the firms, Panel B shows the situation of SMEs, and Panel C shows that accounts receivables for all firms and for SMEs. Panel A shows that trade credit experienced slowly growth from 2006 to 2009, but after that it grew sharply between 2009 to 2010, and then slowed down again from 2010 to 2011. Compared to trade credit, bank loans not only fell down before the financial crisis, but also decreased sharply from 2010 to 2011. It is speculated that due to the financial crisis of 2008, the GDP growth rate of China fell to 9.2% in 2011 and 7.8% in 2012, which is a big brake because China's economy had maintained a robust growth rate of nearly 10% from 1978 and 2008.

As shown in Panel B, SMEs kept a lower ratio of trade credit growth before the financial crises; however, they grew very rapidly after the Lehman shock, particularly from 2009 to 2010. Their growth slows down from 2010, but not as sharply as Panel A. Compared with trade credit, bank loans for SMEs do not experience obvious changes because SMEs often lack of financial support from banks in China (Liu, Fujiwara, Jinushi & Yamori (2016)) whether or not there is a financial crisis.

Panel C provides accounts receivables and net trade credit for all firms. The using of accounts receivables going up from 2006 to 2014. While the accounts receivables for SMEs raised fast from 2010 to 2012 this is consistent with panel a, which suggests that both supplier and customer are using more trade credit practically for SMEs after the financial crises. These phenomenon in China is consistent with the research of Love, Preve, and Sarria-Allende (2007), who found that firms decreased trade credit both before and after financial crises.

Table 2 details the means of the key dependent and independent variables by years. In 2010, accounts payables and accounts receivables largely increased, but bank loans fell as a results of the growth of both trade credit suppliers and demanders. This is also consistent with the data of net trade credit and interest rate, which were both negative in 2010.

3 Model and analyses

3.1 Hypotheses and fixed effects of regression

In this section, the substitution and complementation hypotheses between trade credit and bank loans are tested. We also investigate the relationship between trade credit and bank loans before and after the Lehman Brothers shock. The hypotheses are summarized as follows:

Hypothesis 1: *Trade credit may provide better access to capital for firms than intermediate financing sources. In this case, it is said that trade credit and bank loans have a substitute relationship, in particular for firms with weak banking relationships.*

Hypothesis 2: *Trade credit may provide better access to capital for firms (particularly for SMEs) before, during, or after the financial crisis period.*

Hypothesis 3: *If firms can obtain loans from banks as well as trade credit, it is said that they have a complementary relationship with each other.*

These three hypotheses will be tested for Chinese industry enterprises. The first function is given by:

$$TC_{it} = \beta_0 + \beta_1 Bankloan\_totalassets\_ratio_{it} + \beta_2 \ln\_scale_{it} + \beta_3 \ln\_worker s_{it} + \beta_4 \ln\_Total\_assets_{it} + \beta_5 \ln\_stock_{it} + \beta_6 Interest\_rate_{it} + \beta_7 Year\_dummy_{it} + \varepsilon_{it} \quad (3\text{-}1)$$

Where TC_{it} is the amount of trade credit for firm *i* in year *t*. There are two dependent variables to express TC_{it}, namely accounts payable/total assets, and accounts receivable/total assets. The accounts payable group offers trade credit and the accounts receivable group supplies trade credit. The log value of scales, worker numbers, total assets, stocks, and interest rate are control variables to explain the firms' characteristics. Finally, the year dummy is used to control the fixed effects of other variables, as well as the year effects.

Then, we put firm size and firm ownership dummy variables to report the size and ownership of Chinese industrial firms. Cross terms are created to cross the ownership dummy and the firm size dummy with bank loans, in order to find the features of Chinese industrial enterprises. According to this, the second function is given by:

$$TC_{it} = \beta_0 + \beta_1 Bankloan\_totalassets\_ratio_{it} + \beta_2 \ln\_scale_{it} + \beta_3 \ln\_worker s_{it} + \beta_4 \ln\_Total\_assets_{it} + \beta_5 \ln\_stock_{it} + \beta_6 Interest\_rate_{it} + \beta_7 Bankloans \times firm\_size\_dummy_{it} + \beta_8 Bankloans \times firm\_ownership\_dummy_{it} + \beta_9 Year\_dummy_{it} + \varepsilon_{it} \quad (3\text{-}2)$$

Using functions (3-1) and (3-2), the regression is run using the dataset. The results are summarized in Table 3 which reports on the fixed effects analysis. In Table 3, Columns 1 ~ 3 report the fixed effects tests on the accounts payable to total assets ratio, and Columns 3 ~ 6 show the fixed effects tests on the accounts receivable to total assets ratio. Cross terms are created to cross the ownership dummy and the firm

size dummy with bank loans.

Table 3 The results of the trade credit analysis with fixed effects

Dependent variables	(1) Payables	(2) Payables	(3) Payables	(4) Receivables	(5) Receivables	(6) Receivables
Bankloan_totalassets_ratio	-0.941***			-0.00435*		
	(0.216)			(0.002)		
ln_scale	-0.00609***	-0.00910***	-0.00909***	-0.00358***	-0.00359***	-0.00359***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ln_workers	0.00946***	0.00548***	0.00452**	0.000881	0.0011	0.000858
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
ln_Total_assets	-0.0290***	-0.0290***	-0.0289***	-0.0285***	-0.0284***	-0.0284***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
ln_stock	0.0105***	0.0126***	0.0126***	0.00562***	0.00555***	0.00559***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Interest rate	-0.000239	-0.000843***	-0.000839***	-0.0000822	-0.0000802	-0.0000774
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Bankloans of small firm		-0.0440***			-0.0038	
		(0.003)			(0.003)	
Bankloans of medium firm		-0.0850***			-	
		(0.011)				
Bankloans of large_firm		-			-0.480**	
					(0.206)	
Bankloans of state owned			-0.102***			-0.0490*
enterprises			(0.036)			(0.030)
Bankloans of			-0.188***			-0.0284
collectively owned enterprises			(0.032)			(0.026)
Bankloans of private			-0.0431***			-0.00292
enterprises			(0.003)			(0.003)
Bankloans of joint & share			-0.146***			-0.0318*
holding enterprises			(0.020)			(0.017)
Bankloans of foreign			-			-
enterprises						
D_2006	-0.0184***	-0.0240***	-0.0238***	-0.0315***	-0.0314***	-0.0313***
	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
D_2007	-0.0116***	-0.0172***	-0.0171***	-0.0235***	-0.0234***	-0.0234***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
D_2008	-0.00265	-0.0113***	-0.0112***	-0.0214***	-0.0213***	-0.0213***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
D_2009	-0.0111***	-0.0165***	-0.0163***	-0.0202***	-0.0202***	-0.0201***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
D_2010	-0.0093	-0.00454	-0.00459	0.00723	0.00771	0.0074
	(0.008)	(0.008)	(0.008)	(0.006)	(0.006)	(0.006)
D_2011	0.00256	0.00219	0.00274	0.0182***	0.0179***	0.0183***
	(0.007)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
D_2012	0.00679	0.0211***	0.0218***	0.0297***	0.0296***	0.0298***
	(0.007)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
D_2013	0.0143*	0.00969	0	0.0155***	0.0154***	0.0156***
	(0.007)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
D_2014	-	-	-	-	-	-
Constant	0.291***	0.340***	0.345***	0.378***	0.377***	0.378***
	(0.019)	(0.016)	(0.015)	(0.013)	(0.013)	(0.013)
Observations	49070	49070	49070	49374	49374	49374
Number of Firm_ID	18,199	18,199	18199	18,210	18,210	18210
R-squared	0.030	0.032	0.033	0.023	0.023	0.023

Note: This table presents the fixed effects with account payable and account receivable as dependent variables. "-" indicates where the variables were omitted due to multicollinearity. Standard errors are in parentheses. *** indicates p<0.01, ** indicates p<0.05, and * indicates p<0.1.

Firstly, the demanders of trade credit are examined. The accounts payable groups show that bank loans have a strong negative and significant effect on trade credit. SMEs prefer to use trade credit, and the coefficient is negative and significant at the 1% level. This suggests that SMEs may substitute financing sources from institutions with trade credit. On the other hand, regardless of the firm's ownership structure, state owned firms and firms with other ownership structures may also use trade credit as a substitute for bank loans, as the coefficient for the ownership dummy variables are negative and significant.

Secondly, the suppliers of trade credit are analyzed. Columns 3 ~ 6 show the results of the accounts receivable group, which represents the suppliers of trade credit. Compare with the demander group, the coefficients of the variables for large firms and state owned firms are negative and significant. This may suggest that only large firms and state owned firms can supply more trade credit before and after a financial crisis instead of bank loans. The signs of the coefficients for both the demanders and suppliers of trade credit confirm the theory that there may be a substitute relationship between trade credit and bank loans (Hypothesis 1). These findings may also suggest that SMEs use trade credit more often than bank loans. They may also show that trade credit and bank loans have a simultaneity problem, so in the next section, a GMM analysis test is conducted to determine whether this is the case.

3.2 GMM analysis

Depending on the section 3.1, it may indicate a simultaneity problem. Thus, to avoid this issue, all trade credit variables are lagged by one year. Using GMM in the following regression, the results are shown in Table 4.

$$TC_{it} = \beta_0 + \beta_1 TC_{i,t-1} + \beta_2 Bankloan\_totalassets\_ratio_{it} + \beta_3 \ln\_scale_{it} + \beta_4 \ln\_worker s_{it} + \beta_5 \ln\_total\_assets + \beta_6 \ln\_stock_{it} + \beta_7 Interest\_rate_{it} + \beta_8 Bankloans \times firmsize\_dummy_{it} + \beta_9 Bankloans \times ownership\_dummy_{it} + \beta_{10} Year\_dummy_{it} + \varepsilon_{it} \quad (3\text{-}3)$$

The data are presented in the same way, with the accounts payable and accounts receivable as dependent variables. Compared to function (3-2), function (3-3) uses dynamic panel data with the GMM method to analyze the effect of the relationship between trade credit and bank loans.

Table 4 The results of the trade credit analysis with GMM model

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables	Payables	Payables	Payables	Receviables	Receviables	Receviables
L.Payable_totalassetsl_ratio	0.224***	0.224***	0.223***			
	(0.027)	(0.027)	(0.027)			
L.Receiveble_totalassets_ratio				0.216***	0.216***	0.216***
				(0.029)	(0.029)	(0.029)
Bankloan_totalassets_ratio	-0.176***	-0.154***	-0.243***	-0.0128*	-0.0112	0.0165
	(0.015)	(0.018)	(0.086)	(0.007)	(0.007)	(0.060)
ln_scale	-0.0328***	-0.0328***	-0.0327***	-0.00638***	-0.00635***	-0.00635***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
ln_workers	0.0126***	0.0119***	0.0125***	-0.00314	-0.00281	-0.00305
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
ln_totalassets	-0.00157	-0.00148	-0.0017	-0.0231***	-0.0231***	-0.0231***
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
ln_stock	0.0130***	0.0131***	0.0130***	0.00304**	0.00301**	0.00298**
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Interest rate	-0.146***	-0.147***	-0.146***	-0.0236***	-0.0234***	-0.0231***
	(0.015)	(0.015)	(0.015)	(0.006)	(0.006)	(0.006)
Bankloans of small firm		-0.0252			-	
		(0.018)				
Bankloans of medium firm		-0.0127			-0.0122	
		(0.012)			(0.014)	
Bankloans of large_firm		-			-0.0276	
					(0.016)	
Bankloans of state owne			0.261***			-0.0488
enterprises			(0.096)			(0.073)
Bankloans of collectively			-			-
owned enterprises						
Bankloans of private			0.0675			-0.0263
enterprises			(0.087)			(0.060)
Bankloans of joint & share			0.0116			-0.0486
holding enterprises			(0.098)			(0.072)
Bankloans of foreign			0.0839			-0.133
enterprises			(0.111)			(0.082)
D_2007	-0.0157**	-0.0158**	-0.0155**	-0.0598***	-0.0595***	-0.0597***
	(0.007)	(0.007)	(0.007)	(0.013)	(0.013)	(0.013)
D_2008	-0.0107*	-0.0107*	-0.0105	-0.0596***	-0.0593***	-0.0594***
	(0.006)	(0.006)	(0.006)	(0.013)	(0.013)	(0.013)
D_2009	-0.0151**	-0.0152**	-0.0148**	-0.0558***	-0.0556***	-0.0557***
	(0.006)	(0.006)	(0.006)	(0.013)	(0.013)	(0.013)
D_2010	-	-	-	-0.0165	-0.0162	-0.0161
				(0.011)	(0.011)	(0.011)
D_2011	0.0054	0.00573	0.00507	-0.0128*	-0.0128*	-0.0129*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
D_2012	0.0134	0.0137	0.0134	-0.00875	-0.00873	-0.009
	(0.009)	(0.009)	(0.009)	(0.006)	(0.006)	(0.006)
D_2013	0.0253**	0.0256**	0.0249**	-	-	-
	(0.010)	(0.010)	(0.010)			
D_2014	0.0269**	0.0271**	0.0263**	-0.00135	-0.00129	-0.00131
	(0.011)	(0.011)	(0.011)	(0.005)	(0.005)	(0.005)
Constant	0.244***	0.247***	0.244***	0.400***	0.399***	0.400***
	(0.035)	(0.035)	(0.035)	(0.037)	(0.037)	(0.037)
Observations	13950	13950	13950	14266	14266	14266
Number of Firm_ID	8,247	8,247	8,247	8,388	8,388	8,388

Note: This table presents the results of the GMM model with accounts payable and accounts receivable as dependent variables. L.Payable_totalassetsl_ratio is (account payable/total assets) in year t-1, and L.Receivable_totalassets_ratio is (account receivable/total assets) in year t-1. "-" indicates where the variables were omitted due to multicollinearity. Standard errors are in parentheses. *** indicates p<0.01, ** indicates p<0.05, and * indicates p<0.1.

The results in Table 4 show that the coefficients of bank loans are almost negative and significant. For the customer groups, the coefficient of bank loans is negative and significant, which suggests that trade credit and bank loans have a substitute relationship. In column 3, the coefficient of state owned enterprises is positive and significant, which suggests that only the state owned enterprises can use trade credit in a complementary relationship with bank loans. By contrast, the coefficients of bank loans variables with supplier group are mixed or statistically insignificant. Note that the simultaneity problem has been avoided by lagging the trade credit variables, but the results regarding firms' ownership structures were still mixed. A more in-depth knowledge about formal and informal financial sources may be required as a key to understanding the determinants of how and why firms extend trade credit.

4 Conclusions

Using the panel dataset of Chinese industrial firms, this study finds that SMEs prefer to use trade credit to bank loans. Unlike large firms, SMEs use trade credit as a substitute for bank loans, particularly after a financial crisis period. The analysis also finds that ownership structure does not determine whether there is a substitution or a complementation relationship between trade credit and bank loans, but state owned enterprises may use trade credit as a complementary financial resource in addition to bank loans.

A clear distinction is made to examine trade credit by supplier and demander. According to the results of our analysis, both supplier and demander groups have a strong substitute relationship between trade credit and bank loans. Therefore, trade credit is a very important financial source for enterprises, particularly for SMEs, in China. In another words, compared to bank loans, trade credit between business partners may be more likely for SMEs. These findings are consisted with the hypotheses 1 and 2.

By testing the substitution and complementation hypotheses between trade credit and bank loans with this data, it was also noted that the substitution and complementation hypotheses may be different when firms' attributes change. In the future, the determinants of trade credit should continue to be studied further.

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