Chapter 48
The Substitution Effect of Trade Credit Financing in an Emerging Economy: Empirical Evidence from China

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Abstract Trade credit, together with short term bank credit, forms the main short-term financing channels for enterprises. Using the data of the Chinese listed companies during the period from 1998 to 2009, this paper verifies the substitution effect of trade credit financing on short-term bank credit in an emerging economy. This study further finds that the substitution effect of trade credit financing trade credit is relatively stronger in private owned enterprise than in state-owned enterprises, and weaker in areas with higher degree of financial development. The results indicate that in China's imperfect financial system, trade credit is particularly important for private owned enterprise' financing, while state-owned enterprises are less subjected to financing constraints. In addition, the study found that with the development of the financial market in China, the substitution effect of trade credit will decrease with the improvement of the credit allocation efficiency.

Keywords Trade credit · Bank credit · Substitution effect · State ownership · Financial development

48.1 Introduction

Trade credit is the loan relationship among enterprises due to the deferred payment or advance payment of buying goods or services. It is a kind of "spontaneous financing" coming from commodity exchange, which has the dual nature of finance and business. Trade credit gain is closely related to corporate business strategy and specific industry circumstance, which is not completely at the enterprises' will [23].

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Extensive application of trade credit makes it an important way of informal short-term financing. Some scholars e.g. Garmaise and Moskowitz [12], Guiso et al. [15] found that even in a developed financial market, informal financing channel is still important for enterprises. In the area with less developed financial market, trade credit even plays a more important role as an alternative channel of external financing [31].

The Trade credit-bank credit substitution hypothesis was first introduced by Meltzer [21]. He found that the conjecture by which credit rationing favors large firms was not established, because banks and financial institutions were not the only source of credit for small firms. He showed that during money tightening period in mid-1950s in the US, firms with relatively large cash balances increased the average length of time for which Trade credit was extended, thus favoring the firms against whom the credit restriction was said to discriminate.

Since then, there have been numerous studies about the interactions between trade credit and short term loan. Brechling and Lipsey [3], Jaffee and Modigliani [18], Jaffee [17], Herbst [16] and Duca observed in one way or another that credit-constrained firms made a larger use of trade credit when credit conditions were tighter. Using a long period data from United States. Nilsen [24] confirmed that enterprises with difficulty in obtaining bank loans would finance through trade credit. Love [20] also found international evidence for substitution effect. Using the data of the listed companies in China, Shi [29] found that there existed an alternative relation between trade credit and bank loan, which was negatively correlated with the business cycle.

However, using the data in a period from 1970 to 1990s in United States, Oliner and Rudebush [25], Gertler and Gilchrist [13] found that Meltzer's substitution effect hypothesis is not necessarily true. Some scholars even provide opposite evidence against substitution effect. Ono [26] held the opinion that banks prefer issuing loans to firms with well financial and operation conditions, and such firms are more likely to gain trusts from their suppliers, so they could receive more trade credit. Using the data from manufacturing sector of Japan, Ono [26] found evidence for a complementary relationship instead of substitutive relationship between the trade credit and short term bank loan. Moreover, Danielson and Scott [7] utilized both direct indexes (e.g. whether a firm successfully obtain a loan recently) and indirect indexes (e.g. the duration of the relation between firms and banks) to measure the level of credit constraints, and found that the the quantity of bank loans and trade credit were positively correlated. It implied that the abilities of using bank loan and trade credit were coincident. This was to say they were possibly complemented.

Using the data of Chinese listed firms, this paper investigates the substitution relationship between trade credit and bank loan, while considering the ownership structure of the firms and the different degree of financial development in different areas of China. Specifically, we want to answer the following questions: Can trade credit significantly serve as a substitute of bank loan in China? Is there any difference between stated-owned enterprises and private enterprises in terms of the interaction relationship between short term bank loan and trade credit? Last but not least, how will firms' dependence on trade credit financing change with the development of financial market in China?

48.2 Theoretical Analysis and Hypothesis

The hypothesis that trade credit can serve as a substitute of bank loan was first suggested by Meltzer [21] and then further supported by the theory of credit redistribution and comparative advantage of financing with trade credit. The theory of credit redistribution suggests that the companies with easier access to credit from formal institutions will redistribute their bank loan in forms of trade credit to the firms who can hardly gain credit from banks [24]. In this case, corporations that face difficulties in obtaining bank credit will choose trade credit as an alternative channel of financing.

Compared with financial institutions such as banks, corporations have comparative advantages in credit allocation. That's why credit redistribution prefers non-financial enterprises Schwartz [28]. Firstly, comparing to the banks, the suppliers of trade credit have an advantage in obtaining information about the credit receiver. The business relationship with the customers makes the suppliers have more opportunities to get in touch with their customers, obtain information of their production and operating conditions timely and make adjustment for credit extension with such information [4, 30]. Of course, banks can search for such information as well, but since the corporations is unwilling to reveal their undesirable operating information to banks, the cost and deviation of getting information are higher than the suppliers [11]. Secondly, the suppliers of trade credit have an advantage in risk control. When the operating and credit conditions of the customers deteriorate and the possibility of paying back the credit falls, the suppliers can cut off the supply of raw materials to threaten their customers and ask for credit repaying [6, 32]. Banks, on the contrary, have less effective threat and control on the customers. The banks' influence on the production and business activities of firms in short term is quite limited if not none, when the banks allege that they will cut off the credit supply in future. Thirdly, the suppliers of trade credit have an advantage in retrieving property after the contract violation. Once a credit contract is forcefully suspended due to the customers' business failure, suppliers can resell the materials or productions in a lower price to their other existed partners Mian and Smith [11, 19, 22]. The disposal cost of the assets is generally higher for the banks because of their lack of information on the companies.

Furthermore, the information asymmetry problems in the market, such as adverse selection and moral hazard, may cause credit rationing. In the case of credit rationing, some enterprises will fail to obtain bank credit even if they are willing to pay higher interest rates than the market level, and thus resort to trade credit as a substitute regardless of its higher cost.

As an emerging market, the development of China's financial market is greatly inferior to the developed ones in U.S. or Europe. The banking system in China led by big-four state-owned commercial banks are heavily criticized for its inefficiency in capital allocation [1], leaving a large number of enterprises, especially the small and medium sized private firms in financial constraints. Relative to bank loan, the trade credit among enterprise have comparative advantages mentioned above and are widely used in firms' short-term financing as a substitute for bank loan. Therefore, we make the following hypothesis:

Hypothesis 1 Trade credit serves as a substitute of bank loan in China, i.e., the firms with less bank loan will significantly obtain more trade credit financing.

State ownership still accounts for a large proportion in China nowadays. State-owned enterprises bare a lot of social burden for the government and have motivations to ask the government for different kinds of compensations and privileges, such as credit offers, tax benefits, legal protection and industry access, etc. [8]. When state-owned enterprises fall into financial distress due to poor operation and management, the government may provide support to help them solve out the problem when it's necessary, which is equivalent to providing implicit guarantees. As a result, banks are still more inclined to provide credit to the state-owned enterprises instead of private ones, for the state-owned enterprises are less likely to default under the government's implicit guarantees.

Furthermore, the four major state-owned banks lead the financial markets of China. These banks possess more than 70 % of the credit funds and dominate the credit market. The state owned banks have a natural preference to allocate credit to state owner enterprises since they are both controlled by the government. As a result, credit resources are disproportionately allocated to state-owned enterprises, whereas private firms find it difficult to obtain support from banks [1]. A great deal of literature has revealed obvious credit discrimination against private firms in China [2, 14], which makes the private enterprises encounter serious financing constraints [5]. Nevertheless, Cull and Xu [5] reminds that the state-owned corporations with low efficiency will redistribute their bank credit to those efficient non-state-owned enterprises in forms of trade credit. Therefore, we should expect that the substitution effect of trade credit financing will be more significant among private owned enterprises instead of state owned ones, which yields the following hypothesis:

Hypothesis 2 The substitution effect of trade credit financing is more significant among private owned enterprises than among state owned ones.

The process of marketization and reform in financial system in China has made a great progress since 1978. However, due to different resource endowments, geographic locations and regional policies, marketization and the development of financial markets in different regions varies. Comparing to the provinces with lower degree of financial development, those with more developed financial system grant the local firms with easier access to bank loans [34], which will relieve the financing constraints of the local firms and thus their demand for trade credit. As mentioned in the analysis for Hypothesis H1, the difficult access to back credit due to credit rationing under information asymmetry, and the comparative advantages of trade credit financing are key reasons for the substitution effect of trade credit on bank credit. With the development of financial markets, the information asymmetry and credit rationing problem in formal credit market will be alleviated, and the comparative advantage of trade credit will be lower, and thus the substitution effect of trade credit financing tend to decrease. According to the analysis above, we make the hypothesis below:

Hypothesis 3 In areas with higher degree of financial market development, the substitution effect of trade credit financing is weaker.

48.3 Data and Model

48.3.1 Data and Variables

The original sample of this paper consists of all non-financial A-share listed firms in China from 1998 to 2009 to test the hypotheses above. We omitted the observations that satisfy any one of the following conditions:

1. The banks and other financial firms;
2. The companies whose financial data is missing for five consecutive years during 1998–2009;
3. The Special Treated (ST) companies. Based on the Industry Classification Standard set by China Securities Regulatory Commission, we classified the firms into 22 industry categories, where the manufacturing industry is classified according to the secondary classification code.

Following the mainstream research in this field [10, 27], this paper uses the ratio of accounts payable to total assets as the proxy for trade credit financing (TC) used by the firm, i.e., the dependent variable of our empirical models. The main explanatory variable is short term bank credit (SBC) which is measured by the ratio of a firm's short-term borrowings from banks to its total asset. Then, the coefficient in front of the variable of short term bank credit can indicate whether there is an substitution relationship between trade credit and bank credit as well as the strength of the substitution effect. We use the dummy variable whether firms' ultimate controller is the state owned as the proxy for state ownership (STATE). The indexes for financial market development of different provinces are from the Report of regional marketization Index in China (1997–2007) by Fan et al. [9]. We mainly use the index of financial market development (FDV) in the report.

Other variables include profitability, size, leverage, inventory turnover rate, current asset turnover rate, the interest rate of the borrowings from banks, and the liquidity ratio of a firm. Taking into account the influence of regional differences on firms' operating activities, we also include province dummies. Finally, we include industry dummies (INDUSTRY) and year dummies (YEAR) to control the fixed effects of different industries and time periods. We delete the samples that have missing data in the above key variables, and finally got 10101 observations. The definitions of our variables and their summary statistics are shown below in Table 48.1.

48.3.2 Regression Model

In order to test the substitution relationship between trade credit and short term bank credit, our basic regression model is as below:
(1) Where TC is the variable of trade credit financing, which is measured by the ratio of accounts payable to total assets. SBC is the ratio of short-term bank loan to total

Table 48.1 List of variables and summary statistics

Variable	Definition	Mean	Std. Dev.	Min	Max
TC	Trade credit, accounts payable/total assets	0.077	0.06	0	0.693
SBC	Short-term bank credit/total assets	0.158	0.12	0	1.506
SOE	1 if state owned, 0 otherwise	0.710	0.46	0	1
PROFIT	Profitability, net profit /sales revenue	0.071	0.96	−0.481	0.441
SIZE	Natural logarithm of total assets	21.297	0.18	12.314	27.488
LEV	Leverage, total debts/total assets	0.475	0.15	0.033	3.331
Iturnover	Inventory turnover rate, cost of goods sold/average inventory	7.427	10.78	0.255	55.824
Aturnover	Current asset turnover rate, main business net income/average current assets	1.471	1.06	0.192	4.773
FDV	The index for financial market development by Fan and Wang	7.22	2.35	0	11.71
LiquidR	Liquidity ratio, current assets/current liabilities	1.704	1.91	0.001	55.741
Intr	Interest rate, interest expenses/total borrowings from banks	0.053	0.05	0.015	0.245

assets. *X* are a set of control variables including size, profitability, financial leverage, Inventory turnover rate, current asset turnover rate, and state ownership. We also add a year dummy and an industry dummy to control the fixed impacts of macroeconomic fluctuation and different industries. The coefficient indicates whether there is a substitution relationship between trade credit and bank credit.

However, it should be noted that the explanatory variable, bank credit, is not exogenously given, but may be affected by other factors. Besides of the control variables included in Model (1), there might be some other omitted variables affecting access to trade credit and bank credit simultaneously, leading to a endogeneity bias.

To solve the endogeneity problem, we further use a two-step least square (2SLS) regression model with instrumental variables for short term bank credit. Since a firm's access to short term bank credit mainly depends on its short term repaying ability while the firm's access to trade credit depends more on its operation performance, we can use the firm's repaying ability, measured by the liquidity ratio (LiquidR), as the instrumental variable of short term Bank credit [29]. In addition, the interest rate charged on the bank credit (Intr) is also a nice instrumental variable, since it is closely related to the quantity of short term bank credit but has no direct effect on the access to trade credit. Therefore, in the first step, we use short term bank credit as the dependent variable, and run the regression as follows:

(2) Where Intr and LiquidR represent the instrumental variables, interest rate and liquidity ratio respectively. *X* includes the same set of control variables as Model (1), and represent the year and industry dummies respectively.

Table 48.2 The relationship between bank credit and trade credit

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
SBC	−0.124[a]	−0.267[a]	−0.123[a]	−0.268[a]
	(−24.75)	(−5.01)	(−24.59)	(−5.05)
Lev	0.131[a]	0.179[a]	0.131[a]	0.179[a]
	(39.39)	(9.55)	(39.51)	(9.58)
Iturnover	−0.000[a]	−0.000[a]	−0.000[a]	−0.000[a]
	(−3.10)	(−2.55)	(−3.07)	(−2.55)
Aturnover	0.016[a]	0.177[a]	0.016[a]	0.018[a]
	(26.26)	(12.81)	(25.90)	(12.58)
Profit	−0.024[a]	−0.030[a]	−0.023[a]	−0.028[b]
	(−6.19)	(−2.70)	(−5.79)	(−2.53)
Size	−0.003[a]	−0.008[a]	−0.003[a]	−0.008[a]
	(−4.79)	(−5.03)	(−5.56)	(−5.31)
SOE			0.006[a]	0.005[a]
			(5.29)	(1.99)
Industry dummies	Controlled	Controlled	Controlled	Controlled
Year dummies	Controlled	Controlled	Controlled	Controlled
N	10101	10101	10101	10101
R2	0.399	0.381	0.401	0.381

Note The t statistics were computed using the robust standard errors clustered at the firm level and are shown in parentheses. [a] $p < 0.001$. [b] $p < 0.05$. [c] $p < 0.01$

Then we run the second step regression by replacing the variable of SBC in Model (1) with the fitted value of the first-step regression in Model (2). Again, the coefficient in front of the new SBC variable indicates whether there is a substitution relationship between short term bank credit and trade credit.

To investigate the effect of state ownership and financial market development on the relationship between trade credit and bank credit, we will further add the interaction term between state ownership and short term bank credit (SOE × SBC), and the interaction term between index of financial market development and short term bank credit (FDV × SBC) into Model (1).

48.4 Empirical Results

The baseline results of OLS and 2SLS regressions are shown in Table 48.2. Either the OLS regression results or the 2SLS regression results in Table 48.2 show that relationship between trade credit and bank credit are significant and negative after controlling the effect of other variables such as firm size, financial leverage, profitability, inventory turnover rate, current asset turnover rate, state ownership as well the industry and year dummies. These results verify our Hypothesis 1: trade credit

Table 48.3 The effect of state ownership and financial market development on the relationship between bank credit and trade credit

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
SBC	−0.127[a]	−0.390[a]	−0.080[a]	−1.950[b]
	(−17.13)	(−3.75)	(−5.73)	(−2.28)
Lev	0.133[a]	0.180[a]	0.132[a]	0.183[a]
	(40.49)	(10.06)	(40.35)	(8.22)
Iturnover	−0.000[a]	−0.000[a]	−0.000[a]	–
	(−3.14)	(−2.70)	(−3.30)	–
Aturnover	0.016[a]	0.018[a]	0.015[a]	0.015[a]
	(27.02)	(12.59)	(25.91)	(7.08)
Profit	−0.024[a]	−0.226[b]	−0.023[a]	−0.045[b]
	(−6.11)	(−2.11)	(−5.93)	(−2.41)
Size	−0.003[a]	−0.009[a]	−0.003[a]	−0.008[a]
	(−4.98)	(−5.43)	(−6.26)	(−4.51)
SOE	0.005[b]	−0.027[b]	0.006[a]	0.010[b]
	(2.64)	(−1.88)	(5.41)	(2.63)
SOESBC	0.002	0.185[b]		
	(0.30)	(2.17)		
FDV			−0.121[b]	−0.266[b]
			(−0.68)	(−1.96)
FDVSBC			0.113[c]	0.183[b]
			(1.77)	(2.10)
Industry dummies	Controlled	Controlled	Controlled	Controlled
Year dummies	Controlled	Controlled	Controlled	Controlled
N	10732	10101	10732	10101
R2	0.398	0.372	0.400	0.348

Note The t statistics were computed using the robust standard errors clustered at the firm level and are shown in parentheses. [a] $p < 0.001$. [b] $p < 0.05$. [c] $p < 0.01$

can serve as a substitute of short term bank loan, i.e., the firms with less short bank loan will significantly obtain more trade credit financing.

We can also observe in Table 48.2 that the state ownership (SOE) has a significant and positive effect on access to trade credit. The significance level is 1 % in OLS regression and 5 % in 2SLS regression. Therefore, the state owned enterprises have an advantage in obtaining trade credit financing, comparing to the non-state owned ones. This result indicates that the government's implicit guarantee on SOE can not only facilitate its access to bank credit, but also ease trade credit financing. This result is consistent with Ying et al. [33].

Based on the baseline results, we continue to add the cross term of state ownership and short term bank credit (SOE × SBC) and the cross term of local financial market development and short term bank credit (FDV × SBC) into regressions, to test the effect of state ownership and financial market development on the relationship between short term bank credit and trade credit. The results are shown in Table 48.3.

Although the coefficient on the cross term SOE × SBC is not significant in the OLS regression shown in column (1), it is positive and significant at 5 % in the 2SLS regression shown in column (2). The positive coefficient on SOE × SBC shows that the substitution effect of trade credit is weaker in state-owned enterprises but stronger among non-state-owned enterprises, which is consistent with our Hypothesis H2. According to earlier research (e.g Danielson and Scott [7]), the the strength of substitution relationship between trade credit and bank loans could reflect the degree of credit rationing and credit constraints. As mentioned in our theoretical analysis, the non-state-owned corporations are more likely to be subject to the credit rationing or constraints, and thus will depend more on trade credit as an alternative channel of financing, leading to a stronger substitution effect.

It is also shown in column (3) and (4) of Table 48.3 that the coefficient on the cross term (FDV × SBC) is significant and positive using either OLS or 2SLS regression. This result verifies that in areas with higher degree of financial development, the substitution relationship between short term bank credit and trade credit is weaker. It is not hard to understand this result. In regions with more developed financial markets, firms have easier access to bank credit, and thus depend less on trade credit, leading to weaker substitution effect of trade credit. Thus, Hypothesis 3 is also verified.

48.5 Conclusions

Using the data of non-financial listed firms in China, this paper empirically tests the interactive relationship between trade credit and short term bank credit. Furthermore, we also investigate the effect of state ownership and financial market development on the relationship between trade credit and short term bank credit. it is found in this paper that firms with less bank credit will significantly obtain more trade credit financing in China, i.e., the trade credit can serve as a substitute of bank credit when a firm is faced with credit constraints.

Further analysis in this paper shows that the the substitution effect of trade credit financing is more significant among private owned enterprises than among state owned ones. This result provides new evidence for the proposition that the private owned enterprises in China have more difficult access to formal credit market than state owned enterprises, and thus depend more on trade credit as an alternative financing channel.

It is also shown in this paper that the degree of local financial market development has a significant influence in the substitution relationship between trade credit and short term bank credit. In areas with higher degree of financial development, the substitution relationship between short term bank credit and trade credit is weaker. This is probably because in regions with more developed financial markets, firms have easier access to bank credit, and thus depend less on trade credit, leading to weaker substitution effect of trade credit.

The findings in this paper indicate that under China's current imperfect financial market system, trade credit is particularly important for private owned enterprise'

financing, while state-owned enterprises' are less subjected to financing constraints. In addition, with the development of the financial market in China, the substitution effect of trade credit will decrease with the improvement of the bank credit allocation efficiency.

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