What Develop Trade Credit? Case of Provinces in China

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Abstract
Using Chinese province-level panel data for 2001–2009, we investigate significant factors for the development of financial intermediation via trade credit in developing economies. First, we confirm that a competitive market environment, a well-functioning legal system and greater bank loans for non-state-sector firms promote the development of trade credit in China. Conversely, corruption hinders its development. Second, proper functioning of the legal system and bank lending to non-state-sector firms are highly likely to be the cause of the complex relationships between these determinants. Finally, an increase in the number of lawyers effectively improves the quality and function of the legal system, which in turn alleviates the harmful influence of corruption on trade credit development.

Keywords: bank loans for non-state-sector firms; competitive market; trade credit development in China; well-functioning legal system; corruption; bank loans for non-state-sector firms.

1. Introduction

Taking China as a case study, we investigate significant determinants for the development of financial intermediation through trade credit in developing economies. In general, developing economies including China do not have a well-developed formal financial system such as banks and a capital market. In this environment, trade credit is an important candidate for effective alternative financing.

Previous studies provide a background for this work. Many have investigated the supplier motivation for offering trade credit. On the one hand, some argue that a competitive market environment promotes the development of trade credit (Klapper, 2008; Van Horen, 2004). Fisman and Raturi (2004) state that competition among suppliers encourages customers to build a relationship with a supplier and establish creditworthiness to obtain trade credit.

On the other hand, securing of property rights by a legal system can positively affect the development of trade credit. In studying the relative importance of the courts and their relationship in contract enforcement in the context of Russia, Ukraine and Eastern European countries, Johnson et al. (2002) confirm that legal protection of property rights by well-functioning courts encourages entrepreneurs to offer trade credit.

However, to the best of our knowledge, there has been no comprehensive empirical analysis of the determinants of trade credit development, particularly in the context of developing economies. Previous studies focused on single determinants of trade credit development and did not investigate the complex relations between determinants. Therefore, we investigate the effective determinants of trade credit development among candidate factors in the context of developing economies. Chinese province-level data are used. The differences in trade credit development between provinces enable us to tackle this issue effectively.

The viewpoint of trade credit development in the context of the Chinese economy also provides important suggestions for our tests.

Pointing out that although it does not have a well-developed legal or financial system, China has one of the fastest-growing economies, Allen et al. (2005) argue that China may be an important counter-example to the focus of the legal and financial literature on formal systems. They suggest that alternative financing channels, rather than formal external finance, support the fastest-growing Chinese firms, namely private firms.

As stated above, one possible alternative financing channel is trade credit. Cull et al. (2009) and Ge and Qiu (2007) explicitly explore trade credit in China. Statistical findings by Fabbri and Klapper (2008) are derived from firm-level micro-data for Chinese firms.

Fisman and Raturi (2004) state that previous research has often treated trade credit access as a proxy for inter-firm trust (Johnson et al., 2002; Fafchamps, 2004). Therefore, our investigation of the determinants of trade credit development in China can be also interpreted as a study of factors that lead to trust between Chinese firms. The development of inter-firm trust should contribute to economic growth in China.

Section 2 explains the conceptual framework. Section 3 specifies the empirical models used and explains the estimation strategy. Section 4 presents the data used for our econometric analysis. Section 5 describes and discusses the estimation results. Conclusions are presented in Section 6.

2. Conceptual framework

In this section we construct the basic framework for our study by introducing several candidate determinants of trade credit development in China and describing the complex relations among them.

2.1. Candidate determinants of trade credit development in China

We consider the following four candidate determinants of trade credit development in China: a competitive market environment, a well-functioning legal system, less corruption, and financial factors affecting demand and supply for trade credit finance.
(1) *Competitive market environment*
(2) *A well-functioning legal system*
(3) *Less corruption*
(4) *Financial factors: demand and supply for trade credit finance*

2.2. Complex relations between the determinants

The determinants mentioned above are not independent but have complex relations with each other. To analyze these complex relations, we consider first-stage estimation results in an econometric analysis using system GMM estimation with "collapsed" instrumental variables. This will give us an insight into which determinants are primary factors in trade credit development, which should be priority targets for policy makers.

3. Empirical models and estimation strategy

This section explains the empirical models and estimation strategy used to analyze the significant determinants of trade credit development in China. For this purpose, we use the following empirical model:

$$\textit{Trade credit development}_{it} = \alpha + \alpha_t + \beta_1 \textit{\textbf{competitive market environment}}_{it-1}$$
$$+ \beta_2 \textit{\textbf{legal system}}_{it-1} + \beta_3 \textit{corruption}_{it-1}$$
$$+ \beta_4 \textit{\textbf{financial factors}}_{it-1} + \varepsilon_{it}, \qquad (1)$$

where i and t denote the province and time (year), respectively, and

$$\varepsilon_{it} = \mu_i + e_{it}.$$

The disturbance term ε_{it} has two components: the province-specific fixed effect μ_i and the idiosyncratic shocks e_{it}. The error term e_{it} is taken to be iid. The province-specific fixed effect μ_i is expected to control unobservable province-specific and time-invariant factors.

We use the system GMM estimation technique developed by Blundell and Bond (1998) in panel estimation to cope with the remaining endogeneity problem of

independent variables. [1] The system GMM estimator is designed to address the endogeneity of independent variables in panel estimation and the weak instrument problem in the first-differenced GMM proposed by Arellano and Bond (1991). It combines regression in differences with regression in levels, where the instruments for the former are generally the lagged levels of endogenous or predetermined variables and the instruments for the latter are the lagged differences of those variables.

Province and year dummies measuring province- and year-specific effects, respectively, can be assumed to be exogenous. Endogeneity is suspected for the other independent variables. A one-period lag is taken for these variables. Strictly speaking, therefore, they are not endogenous but are predetermined variables in that they can be correlated with e_{it-1} and e before period t–1 and cannot be correlated with e_{it} and e after period t. Since realizations of the predetermined variables occur before that of the current error term e_{it}, they cannot be correlated.

Thus, in system GMM, estimation of first-differenced and level equations for (1) is conducted using adequate instrument variables for each equation. The first-differenced equation for (1) removes and controls unobservable province-specific and time-invariant factors, μ_i. Thus, for the first-differenced equation, two-period lagged levels of the predetermined variables (***competitive market environment***$_{t-2}$, ***legal system***$_{t-2}$, *corruption*$_{t-2}$, and ***financial factors***$_{t-2}$) are used as instrumental variables in addition to first-differenced year dummies as exogenous variables. Thus, for estimation of level equation (1), one-period lagged differences for the predetermined variables (*Δ***competitive market environment** $_{t-1}$, *Δ***legal system** $_{t-1}$, *Δcorruption* $_{t-1}$, and *Δ***financial factors** $_{t-1}$) are used as instrumental variables in addition to province and year dummies as exogenous.

To avoid overfitting of large instruments to endogenous variables, we limit instrument variables to two-period lagged levels and one-period lagged differences of the predetermined variables besides exogenous variables, and use these instruments in collapsed form (Roodman, 2008, 2009). Because the data are provincial panel data and the number of individual units (provinces in this case) is relatively small, we should pay particular attention to the overfitting problem in using large instruments. Furthermore, these limited instruments enable us to easily check the first-stage estimation results. This is quite helpful for disentangling the complex relations between determinants of trade credit development in China.

The validity of the instruments introduced above depends on the two following assumptions. The first is that the instruments are exogenous. More precisely, the instruments used are not correlated with current error terms ($\Delta e_{it} = e_{it} - e_{it-1}$) for difference regression and are not correlated with $\varepsilon_{it} = \mu_i + e_{it}$ for level regression. The second is that the pure error term e_{it} is not serially correlated. For these assumptions, two tests are proposed to assess the validity of the instruments. The first, for instrument exogeneity, is the Sargan or Hansen test of overidentifying restrictions, which tests the overall validity of an instrument by checking the validity of moment conditions in the sample used. The second, for serial correlation of e_{it}, is the autoregressive test proposed by Arellano and Bond (1991). Second-order serial correlation of the error term violates the instrument validity. Thus, checking the second-order serial correlation of the differenced error term, AR(2), works as a test for serial correlation of e_{it}.

To measure *trade credit development*, the dependent variable, we use *accounts receivable for non-state-sector firms/gross assets*. Trade credit has an even more important role in the corporate finance of non-state-sector compared to state-sector firms (Ge and Qiu, 2007), which is why we use trade credit development for non-state-sector firms as the dependent variable of our empirical model.

We now turn to the independent variables.

Competitive market environment represents variables for measuring how competitive the economy of a province is for each year. The variables are (*number of*

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[1] See Roodman (2008) for the system GMM estimation.

firms/province industrial gross output$_{-1}$ and *producer price indices for manufactured goods*$_{-1}$. Note that a higher second variable represents a more monopolistic and thus a less competitive market environment. The presence of SMEs, a variant of market competitiveness, is measured by *presence of SMEs in gross output*$_{-1}$ for each province.

Legal system represents variables for measuring how well the legal system works. The variables are (*patent applications accepted/province GRP*)$_{-1}$, (*number of commercial cases received by the court/province population*)$_{-1}$ and (*number of lawyers/province population*)$_{-1}$, where *GRP* is gross regional product.

Corruption measures how serious the corruption situation is in a province for each year. The variable is (*number of registered corruption cases/province population*)$_{-1}$.

Finally, as ***financial factors*** affecting trade credit development, we consider two variables measuring bank loans for non-state-sector and the share of non-state-owned commercial banks in total bank lending: (*bank loans for non-state-sector firms/gross assets*)$_{-1}$ and *share of non-state-owned commercial banks in total bank lending*$_{-1}$.

4. Data
(omitted)

5. Estimation results
Table 2 presents the final system GMM estimation results.

Table 2
Determinants of Trade Credit Development: The Final Results for System GMM Estimation [1,2]

Independent Variables	Dep. Var. = *Accounts receivable for non state-sector firms / gross assets*				
	(1)-1	(1)-2	(1)-3	(1)-4	(1)-5
Province dummy variables	yes	yes	yes	yes	yes
Year dummy variables	yes	yes	yes	yes	yes
(1) Competitive market environment					
(*Number of firms / province industrial gross output*)$_{-1}$	0.004**	0.003**	0.004**	0.003**	0.006**
	(8.110)	(7.183)	(9.131)	(7.109)	(9.182)
Producer price indices for manufactured goods$_{-1}$	-0.016*	-0.013*	-0.011*	-0.016**	-0.019**
	(-2.571)	(-2.549)	(-2.241)	(-3.015)	(-2.666)
Presence of SMEs in gross output $_{-1}$	0.007**	0.010**	0.007*	0.010**	0.009**
	(2.649)	(3.403)	(2.527)	(3.072)	(2.932)
(2) Legal system					
(*Patent applications accepted / province GRP*)$_{-1}$	0.011*	0.007*		0.010*	0.010
	(2.200)	(2.191)		(2.113)	(1.855)
(*Number of commercial cases received by the court / province population*)$_{-1}$		0.009*	0.011*	0.010*	0.007**
		(2.151)	(2.449)	(2.469)	(2.578)
(*Number of lawyers / province population*)$_{-1}$	0.007**		0.008**	0.006**	0.006**
	(4.960)		(6.157)	(3.785)	(3.336)
(*Number of commercial cases received by the court / province population*)$_{-1}$ × (*Number of lawyers / province population*)$_{-1}$					
(3) Corruption					
(*Number of registered corruption cases / province population*)$_{-1}$	-0.005*	-0.006*	-0.006*	-0.005**	-0.007
	(-2.272)	(-2.489)	(-2.162)	(-2.655)	(-1.953)
(*Number of registered corruption cases / province population*)$_{-1}$ × (*Number of lawyers / province population*)$_{-1}$					
(4) Financial factors					
(*Bank loans for non-state-sector firms / gross assets*)$_{-1}$	0.021*	0.018*	0.020**	0.027*	0.019*
	(2.076)	(2.392)	(2.611)	(2.535)	(2.302)
Share of non-state-owned commercial banks in total bank lending $_{-1}$	0.007	0.010	0.008	0.010*	0.008
	(1.500)	(1.695)	(1.754)	(2.355)	(1.878)
(5) Lagged dependent variable					
(*Accounts receivable for non state-sector firms / gross assets*)$_{-1}$					-0.107*
					(-2.356)
p value of Hansen test	0.261	0.208	0.275	0.315	0.153
p value of AR(2) test	0.198	0.266	0.132	0.180	0.400
Obs. No.	279	279	279	279	279

[1] The table presents Blundel and Bond's two-step system GMM results. The dependent variable is *Accounts receivable for non state-sector firms/gross assets*. We report in parentheses the z statistics that based on the Windmeijer (2005)'s finite sample correction to the standard errors in two-step estimation.

[2] The table presents regression coefficients. Numbers in parentheses are the z statistics.

* Significant at 5%.

** Significant at 1%.

For all specifications, the Hansen test of overidentifying restrictions shows p-values that cannot reject the null hypothesis that instruments used for the estimation are exogenous. Furthermore, results for AR(2) also cannot detect serial correlation of e_{it} at the usual critical value for any specification. These results confirm the validity of the instruments used.

For all specifications, the competitive market environment variables (*number of firms/province industrial gross output*)$_{-1}$, *producer price indices for manufactured goods*$_{-1}$ and *presence of SMEs in gross output*$_{-1}$ have significantly positive, negative, and positive coefficients, respectively. These results confirm, as suggested by previous studies, that a competitive market environment promotes the development of trade credit in China.

The legal system variables, namely (*patent applications accepted/province GRP*)$_{-1}$, (*number of commercial cases received by the court/province population*)$_{-1}$ and (*number of lawyers/province population*)$_{-1}$, also have significantly positive coefficients. As found by Johnson et al. (2002) for European transition economies, a well-functioning legal system is also very likely to encourage the development of trade credit in China.

The variable (*number of registered corruption cases/province population*)$_{-1}$, which measures the corruption in province i for year t–1, has a significantly negative influence on trade credit development. As expected, corruption harms the development of trade credit.

One financial factor variable, (*bank loans for non-state-sector firms/gross assets*)$_{-1}$, has significantly positive coefficients. The other financial factor variable, *share of non-state-owned commercial banks in total bank lending*$_{-1}$, also has largely significant and positive coefficients. Greater bank loans for non-state-sector firms are thus a positive factor in the development of trade credit in China. This stems from the trade credit supply mechanism whereby more bank loans for non-state-sector firms facilitates credit creation among firms using trade credit under the biased financial allocation in which state-sector firms are favored for bank loans over non-state-sector firms in China.

Next, we try to disentangle the relations between these determinants of trade credit development in China.

As explained above, because of these limited instruments, we can easily check the first-stage results for system GMM estimation. This check helps us to disentangle the complex causal relations between the determinants of trade credit development in China.

The results suggests that the functioning of the legal system and bank lending to non-state-sector firms are highly likely to be the starting points for the complex causal relations. In addition, they have a direct positive influence on trade credit development in China, as we saw above. Therefore, these two factors should be policy targets with the highest priority for the development of trade credit. In other words, if policy makers want to develop financial intermediation via trade credit in China, improving the quality of the legal system and increasing bank lending to non-state-sector firms (reducing financial support of state-sector firms through bank lending) can be recommended.

6. Conclusions

Using Chinese province-level aggregated panel data for 2001–2009, we investigated significant determinants for the development of financial intermediation via trade credit in a developing economy. The main findings are summarized as follows.

First, we confirmed that a competitive market environment, a well-functioning legal system and greater bank loans for non-state-sector firms promote the development of trade credit in China. In contrast to these factors, corruption hinders its development.

Second, these factors are not independent but have complex relations with each other. We can confirm these relations by checking the first-stage GMM estimation results, which is possible because of the limited instrument variables used in collapsed form.

Third, the first-stage GMM estimation results enable us to disentangle the complex relations between determinants. The statistical evidence suggests that functioning of the

legal system and bank lending to non-state-sector firms are highly likely to be the starting points for these relations. A policy implication arising from this finding is that improving the quality of the legal system and increasing and reducing bank lending to non-state-sector and state-sector firms, respectively, should be given higher priorities for the development of trade credit in developing economies such as China.

This study clarifies how trade credit develops in a developing economy using province-level aggregated panel data. However, many factors in the complicated mechanism of trade credit development in developing economies are unknown. Further research using firm-level micro data is needed to investigate in more detail what factors promote the development of trade credit in developing economies, including China.

References

Arellano, M, and Bond, S (1991), 'Some tests of specifications for panel data: Monte Carlo evidence and an application to employment equations'. *Review of Economic Studies* 58: 277–297.

Allen, F, Qian, J, and Qian, M (2005), 'Law, finance, and economic growth in China'. *Journal of Financial Economics* 77: 57–116.

Blundell, R, and Bond, S (1998), 'Initial conditions and moment restriction in dynamic panel data models'. *Journal of Econometrics* 87: 115–144.

Cull, R, Xu, L, and Zhu, T (2009), 'Formal finance and trade credit during China's transition'. *Journal of Financial Intermediation* 18: 173–192.

Fabbri, D, and Klapper, L (2008), 'Market power and the matching of trade credit terms'. *World Bank Policy Research Working Paper* 4754, World Bank.

Fafchamps, M (2004), *Market Institutions in Sub-Saharan Africa: Theory and Evidence*. MIT Press, Cambridge (Massachusetts)/London.

Fisman, R, and Raturi, M (2004), 'Does competition encourage credit provision? Evidence from African trade credit relationships'. *Review of Economics and Statistics* 86: 345–352.

Ge, Y, and Qiu, J (2007), 'Financial development, bank discrimination and trade credit'. *Journal of Banking and Finance* 31: 513–530.

Johnson, S, McMillan, J, and Woodruff, C (2002), 'Court and relational contracts'. *Journal of Law, Economics, and Organization* 18: 221–277.

Roodman, D (2008), 'How to do xtabond2: An introduction to difference and system GMM in Stata'. *Working Paper* 103, Center for Global Development.

Roodman, D (2009), 'A note on the theme of too many instruments'. *Oxford Bulletin of Economics and Statistics* 71: 135–158.

Van Horen, N (2004), 'Trade credit as a competitiveness tool; Evidence from developing countries'. *MPRA Paper* 2792.