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**DISCUSSION PAPER No.58**  
Trade Credits under Imperfect  
Enforcement: A Theory with a Test  
on Chinese Experience

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June 2006

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**Keywords:** law and finance, economic growth, incomplete contract, enforcement

**JEL classification:** O5, K0, G2, P31

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# Trade Credits under Imperfect Enforcement: A Theory with a Test on Chinese Experience\*

[Very Preliminary: Comments Welcome]

June 20, 2006

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**Abstract** It is widely recognized that trade credit is an important financial mechanism, particularly in developing economies and transition economies where institutions are weak. This paper documents theoretical analysis and empirical accounts on what facilitates an effective supply of trade credit based on original surveys conducted in P.R. of China. Our theory predicts that trade volume and trade credit are increasing function of cash held by the buyer and enforcement technology of the seller. Furthermore, if the state sector's enforcement technology is high, it has positive external effect to expand the volumes of trade credit and trades in the whole economy. From the data, we found that government made active commitment in enforcement of trade credit contract and the government owned firms are main supplier and receivers of trade credit, which suggest that enforcement by government and state sector were effective against presumptions in the previous literatures.

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## I Introduction

Trade credits are important financial mechanism for the firms, particularly for those with poor institutional environment. In developed economies, trade credits are usually facilitated both by a formal contract that invokes contract law, and by informal inter-firm relationships. When laws or institutions related to contracts are not reliable, as we observe in most of developing and transitional economies, how much and in what way do firms rely on trade credits? If the enforcement institutions are completely vacuous, relational contracting based purely on power of related parties can be a possibility. However, in reality, we rarely observe a pure vacuum of enforcement mechanism, and there is a varying degree of enforceability, be it formal or informal, across and within countries.

Viewing in this way, transition from planning to market can be regarded as a natural experiment that varies the enforceability of contracts. Under the 'big bang' type transition, such as in former USSR, we can consider the transition as a negative onetime shock on enforceability. It is, however,

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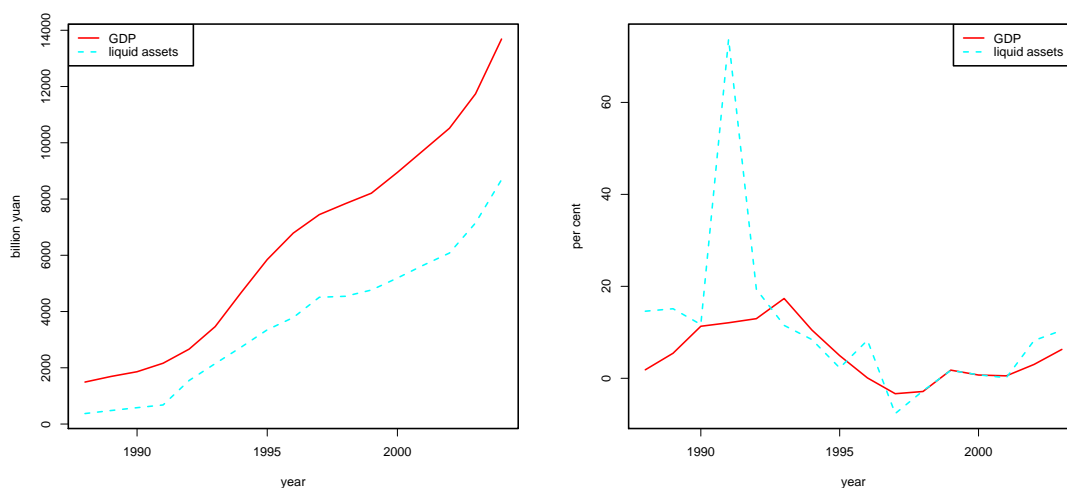
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difficult to identify the effects of loss in enforceability with cross-sectional data of big bang type transition economies, because, firstly, the size of shocks can be different between countries, and secondly, the choice of big bang type transition may be correlated with the country-specific factors that may also affect the use of trade credits, resulting in a selection problem.

Under the ‘gradual’ type transition, as in China and in Viet Nam, it is likely that the state sector, which has remained economically active throughout the transition, to have greater enforceability of contracts. If this is true, one can consistently estimate the effects of enforceability on the use of trade credits by observing inter-firm differences, provided that enforceability is historically and exogenously determined (largely independent from the context of trade credit decisions). This seems to be a reasonable assumption for China. One can safely assume that a greater need for trade credits by the state sector has not been causing the closer relationship between the state sector and the government, relative to that of other sectors, thus there is no endogeneity problem. The state sector, naturally and institutionally, is known to have been keeping a close relationship with the government. And the government has kept law, order, and enforcement on behalf of judiciary who is not endowed with a sufficient enforcement power. It is true that the government’s enforcement is often argued as being imperfect and biased, nevertheless, it might have strengthened the enforceability of trade credit contracts of state sector.

A possibility that the state sector has played some role in securing the trade credit contracts is by no means negligible when we try to understand the puzzling macroeconomic performance of Chinese economy. It is well known that it has some major problems: namely, inefficiency of state sector, corruption of government officials, and mounting arrears of trade credits. The Chinese economy, nonetheless, has outperformed consistently our expectation that they will soon hold back its high growth. One of the answers to the puzzle, which we elaborate in this paper, is the efficiency gain from using trade credits by the state sector. The **Figure 1** shows the comovement of GDP and liquid assets, both in levels and in growth rates, between 1988 and 2004. As evident in the figures, we have a positive correlation between the two, except for 1992 when we saw an explosion of liquid

**FIGURE 1: COMOVEMENT OF GDP AND TOTAL LIQUID ASSETS IN LEVELS (LEFT) AND IN GROWTH RATES (RIGHT)**



Note: Level variables are deflated series. Growth rates are first-differences of log of deflated series.

assets. This is also confirmed by OLS of GDP on liquid assets and prices, both in levels and in first-differences (not shown).<sup>\*1</sup> Although one cannot infer any causality by looking at the positive correlation of the two, it is at least suggestive that the use of trade credits, which increases liquid assets, may have contributed to higher growth of economy through efficiency gains in commercial transactions.

Data we use in this paper, collected in 2003 IDE-DRC survey, include 113 effective respondents; the average employment, sales, and net profits were 290.8, 17.682 million RMB and 0.595 million RMB respectively. All surveyed firms is classified into small and medium sized enterprises, and made enough profits. Here, we asked several questions about the role of the government in ‘enforcement technology’ (see **TABLE 1** and **TABLE 2**).

Then, who is responsible for contract enforcement? Respondents were asked whether or not they agreed that the government (both local and national) would resolve inter-firm conflicts. 45 percent (50/110) of the total agreed. As shown in **TABLE 1**, state owned and collective owned firms, who have supervisory departments in the government, answered yes with higher shares (60 and 100 percent) than average.

However, it is often complained that enforcement by the government has a bias in that the government tends to protect its own local companies against outsiders. **TABLE 2** shows answers to the

**TABLE 1: EVER FAILED IN COLLECTING SALES PAYMENT?**

Have you ever failed in collecting sales payment?				
	No	Yes, but collected finally	Yes, and could not collect at all	Total
Then, how did you cope with this?	31	47	33	113
Change transacting condition	1	19	7	29
Stop transaction		22	15	39
Suit		22	19	43

(Note) multiple answers were given regarding response to the trouble (row questions).

(Source) Institute of Developing Economies-Development Research Centre survey.

**TABLE 2: GOVERNMENT RESOLVES INTER-FIRM DISPUTES?**

		Do you agree that government will resolve inter-firm conflicts?						
		state owned	collective owned	private owned	limited owned	share corporate	others	total
with admin supervisory	Agree	6	2	5	22	3		38
	Total	10	2	11	49	6	1	79
without admin supervisory	Agree			4	6	2		12
	Total		1	9	18	3		31
total	Total who agrees	6	2	9	28	5		50
	Total respondents	10	3	20	67	9	1	110

(Source) Institute of Developing Economies-Development Research Centre survey.

<sup>\*1</sup>The augmented Dickey-Fuller test of nonstationarity cannot be rejected for all three variables, and cointegration of three variables is also not rejected. So the positive correlation we see can be considered as a long-run equilibrium phenomenon.

questions regarding whether or not the local courts give preference to local companies with regard to ‘execution of judgment.’ When suits were filed in the unpaid customer’s hometown, no accused customer executed judgment by themselves; the courts only execute half of the cases (4 out of 9), and 5 out of 9 cases remained unexecuted. When suits were filed in the accuser’s hometown, the accused voluntarily executed judgment in 6 cases, and the courts forced execution in 15 out of 22. Only 1 case remained unexecuted. There seems to be a clear bias in enforcement of contracts and execution of judge to give a preference to insider against outsider of the local administrative border.

According to the descriptive statistics, ‘enforcement technology’ in China seems to have the following characteristics: First, the enforcement probability of the payment contract is far below 100 percent. Enforcement here appears to be imperfect as assumed in our theoretical model. Second, enforcement appears to be carried out by local governments. Third, court enforcement is biased to give a preference to local firms within the court’s jurisdiction.

A survey of the firms in China is used in this paper to document inter-firm financial flow and to examine what kind of enforcement mechanism works in trade credit contracting. The survey gives data on the firm’s trade with specific customers and suppliers from two groups: inside and outside of administrative border of the city that surveyed firms reside. This information allowed us to identify the influence of characteristics of trading partner, e.g. ownership, industry, cash position, etc. Particularly, we focus on different enforcement mechanism among different types of ownership. As we can easily imagine, private ownership has less to do with administrative power over the enforcement mechanism related with trading. On the contrary, the state ownership is likely to have a close relationship with local governments, and it can take an advantage of their administrative power. Enforcement of the local governments is bureaucratic-control in nature, which will be limited within administrative area, and might be biased against some of the related party. We will use the ownership type as a proxy for closeness with local government to identify the effects of enforceability on trade credit financing.

Our main findings are that (a) trade credits are mainly offered and received by the state sector, (b) the privately owned firms receive credits mainly from the state sector, (c) however, we cannot find evidence that the state sector’s enforcement is less effective than privately owned firms in terms of default probability of trade credits. Moreover, enforcement by the state sector may be more effective than that by private sector. (d) These results raise a possibility that the state ownership, despite being inefficient as a producer, may have been an effective supplier of credits that helped sustain the high macroeconomic growth.

## II Imperfect Enforcement and Trade Credit Contract

Our aim is firstly to document firm’s decision over providing and receiving trade credit among mixed types of ownerships in China, secondly to show how different types of ownership have an access to different types of enforcement mechanism that result in different levels of ‘enforcement technology.’

Trade credit is an important financing source in everywhere in the world. Account payable has the largest or second largest shares in liability among G7 countries; 15% of total assets for non financial

of U.S. firms, 15.4% for Japan, 17% for France, 14.7% for Italy, 13.7% for U.K. 13.3% for Canada, and 11.5% for Germany (Rajan and Zingales [1995]). This is the same for developing economies (Demirguc-Kunt and Maksimovic [2001]). The existence and use of trade credit have been explained from three aspects: 1) financing advantage theories, 2) price discrimination strategies or industrial organization, and 3) transaction theories (Petersen and Rajan [1997]).

The first approach claims that trade credit has an advantage in obtaining information on borrower compared to formal lending from financial institutions, and it is a substitute to bank lending. Empirical studies based on data of US supported that trade credit is preferred over bank loan when it has informational advantages on borrower's creditworthiness or quality of products (Petersen and Rajan [1997], Ng, Kiholm Smith and Smith [1999], Berger and Udell [1995], [2001]). Investigation on Japanese data finds that manufacturing industry shows transaction motives, though the service sector shows financial motives (Emery, Ariga and Kawaguchi [1999]).

In developing economies, Fafchamps [2000] finds that ethnic and gender bias is noticeable in obtaining supplier credit, where the network effects among the groups play an important role in this bias, which suggests that network facilitates enforcement in Kenya and Zimbabwe. Cross country studies showed that when financial institutions are weak and minor as a supplier of fund, the industries with higher dependence on trade credit shows higher growth. However, the industrial growth is attributed to aged firms, reflecting an existence of barriers to access to trade credit among younger firms (Fishman and Love [2002]).

Contract theory literature, the second approach, attempts to analyze how trade credit contract comes to be facilitated. If the payment cannot be enforced effectively, trade credit contract will not be taken place. Relational contract based on informal relationship are regarded as a substitute the formal law and courts. McMillan and Woodruff [1999] documented what kind of factor facilitated trade credit in a framework of relational contracting between customers and suppliers. Johnson, McMillan and Woodruff [2002] documented that relational contract are strengthened and trading will be expanded when the courts works more effectively.

Recent law and growth literature, the third approach, also refers to trade credit. The literature claims that British common-law origin legal system is superior to others as it promotes economic growth with strong protections of the shareholder and creditors (La Porta, Lopez-de-Silanes, Shleifer, Vishny [1998][2000], LLSV hereafter), and with more efficient court system (Djankov, La Porta, Lopez-de-Silanes, and Shleifer [2003]).

Allen et al [2003] have shown, however, that People's Republic of China is a good counterexample against propositions of the LLSV. PRC represents 'gradual transition strategy' among post-planned economy, who enjoyed a rapid expansion of economic activities without a substantial withdrawal of government commitment. In China, the informal sector (including both private and quasi-state sectors by their definition) is very active, and this is a primary reason for this country's rapid economic growth, though the legal enforcement mechanism such as protection of shareholder or creditor is quite poor and the private sector is apparently discriminated by the financial institutions on financing (Brandt and Li [2002]).

These literatures suggest that there exist effective alternative financing channels and governance mechanisms for the informal sector in China, such as those based on reputation and relationships,

to support high growth of Chinese economy. However, the informal sector in China does not have economic activity only within itself, but have deep interaction with the state sector. In addition, they have not explained what kind of informal mechanisms actually work in China.

Regarding to trade credit, Takamizawa [2006] documents that legal institution that facilitate credit recovery are weak, and its conflicts are very prevailing in China. Under this environment, Ito [2006] found that the state sector is more active in utilizing trade credit. Referring to these findings, Yanagawa [2006] extends a theoretical explanation that more certain enforcement technology will promote both provision of trade credit as well as the volume of economic activities.

Our paper focuses on the point that state owned firms or quasi-state owned firms play a substantial role in supply and contract enforcement to facilitate trade credit in the Chinese economy. State owned firms have a ‘relationship’ with the legal enforcement sector, and this ‘relationship’ may help to enhance informal mechanisms for enforcement. The novel in our findings is that the state ownership could have provided the private sector with trade credit and related enforcement mechanism.

This paper proceeds as follows: Section 3 will give a theoretical model that explain what happens trade credit flow between government and non-government ownerships. Sections 4 to 6 document empirical studies that include descriptive data and regression results that test our hypothesis based on our original survey in China. Discussion and conclusions are given in Section 6.

### III Theoretical Model

#### III.1 A Simple Model of Imperfect Enforcement

In order to explain the mechanism of trade credit, we consider a simple buyer-seller model. We assume here that the value function of a buyer is  $V(X) = vX$ , and the cost function of a seller is  $C(X) = cX$ , where  $X$  is the trade volume that is endogenously determined in the negotiation process of the buyer and the seller. By assuming that  $v$  and  $c$  are exogenously given  $v > c$ , the first best trade volume is infinite. If there is an imperfect enforcement problem as we will explain below, however, it is not optimal for the seller to provide the first best trade volume.

The imperfect enforcement problem we are thinking about is as follows. Usually the trading price  $P$  is determined to be between  $v$  and  $c$  in order to realize a trade transaction. Even if it is impossible for the buyer to pay the price immediately, the seller can provide a trade credit, and an efficient transaction can be realized. It is assumed here, however, that enforcement for the payment contract is imperfect. Even if buyers promise to pay the contracted price, they may not pay the total promised payment by the promised date. In such a situation, desirable trade may not be realized.

At time 1, the buyer and seller agree to trade a product; they make a contract specifying the payment schedule. In order to deliver the product at time 1, the seller incurs the cost for production  $C(X)$  and plans to receive payment sufficient for the cost. Conversely, the buyer receives the product at time 1 but will get profit from the product,  $V(X)$ , only at time 2. The buyer may thus have to receive trade credit from the seller. It is assumed here that the buyer has cash  $A$  in period 1, and the buyer has to borrow  $(PX - A)$  from the seller. Also, for simplicity, no time discount is assumed. As long as the buyer pays  $(PX - A)$  at time 2 according to the contract, the seller can in the final analysis receive  $PX$ .



If enforcement for the contract is imperfect, however, the situation above may change drastically. The seller has an incentive not to pay  $(PX - A)$  at time 2. To formulate the strategic default incentive for the buyer, we assume that the seller can seize only a part of the buyer's benefit,  $svX$  even if the default occurs.  $s$  is the enforcement technology of the seller and we assume  $s < 1$ . This means that the buyer need not to repay  $(1 - s)vX$ . In this situation, the contracted price  $P$  is almost meaningless. Even if they have agreed to pay a very high price, they can expect that the buyer will default and the seller gets only  $svX$ . Hence the price is set so as to satisfy the following condition.

$$PX = svX + A$$

Suppose the buyer is a monopoly buyer of the product, and that the bargaining power of the buyer is 100%. The equilibrium price is set to maximize the profit of the buyer under constraints that will be explained below. This supposition can simplify the explanation. Qualitative results are not affected, though the bargaining power is less than 100%. The total amount of cash that the buyer has is assumed to be  $A$ . Under this situation, the problem of the buyer becomes as follows.

$$\begin{aligned} \max_{\{X, T\}} \quad & vX - svX - T \\ \text{s.t.} \quad & svX + T \geq cX \\ & T \leq A \end{aligned}$$

Although the total amount of cash that the buyer has is  $A$ , here we consider a possibility that the contracted cash payment,  $T$ , is smaller than  $A$ . Hence we must consider the second constraint, although we can easily prove that the optimal  $T$  is equal to  $A$ . As we explained above the maximum gain of the seller is  $svX + T$ . Since the gain must be higher than the production cost, we get the first constraint.

By solving the above problem, we get the following result as long as  $c > sv$ .

$$\begin{aligned} X^* &= \frac{A}{c - sv} \\ P^* &= sv + \frac{A}{X^*} \\ T^* &= A. \end{aligned}$$

If  $c$  is smaller than  $sv$ , the imperfect enforcement does not become a problem for the seller and  $X^*$  becomes infinite. Since we are interested in the imperfect enforcement situation, hereafter we assume that  $c > sv$ .

The above result shows the equilibrium trade volume  $X^*$  is an increasing function of  $A$  and  $s$ . Moreover the amount of trade credit is also an increasing function of  $A$  and  $s$ .

**Proposition III.1** The equilibrium trade volume and trade credit are increasing functions of  $A$ ,  $s$ .

This proposition means that the enforcement mechanism is important for the trade volume and the profit of the buyer. If the enforcement technology is too low ( $s$  is very low), the buyer will tend to default. Even if  $s$  is low, however, when  $A$  is sufficiently high, the seller's profit can still be high.

## III.2 Sequential Trading

Next we will consider the following sequential trading model to examine the roles of government-owned firms. At time 1, a government-owned firm and a buyer agree a sales contract but a part of the

payment will be done at time 2, that is the government-owned firm gives trade credit to the buyer as we explained above. At time 3, the government-owned firm buys some products from a seller, which gives trade credit to the government owned firm. At time 4, the government owned firm returns the trade credit to the seller.

The relation between the government owned firm and the buyer is just same as the previous subsection. The value function of a buyer is  $V(X) = vX$ , and the cost function of the government owned firm is  $C(X) = cX$ . Since the buyer has only  $A$  at time 1, it has to borrow  $(PX - A)$  from the government owned firm but the government owned firm can expect to get back only  $s^G vX$ . Then the equilibrium trade volume becomes  $X^* = A/(c - s^G v)$  and the government-owned firm gets the cash (*i.e.* the total sales),  $A^G$ , becomes

$$A^G = s^G vX^* + A = \frac{s^G vA}{c - s^G v} + A = \frac{c}{c - s^G v} A$$

We can easily see that  $A^G$  is an increasing function of  $s^G$  and  $A$ , and moreover  $A^G$  is larger than  $A$ .

Next we consider the relation between the government-owned firm and the seller. One important point is that the above  $A^G$  becomes the upfront cash the government-owned firm can pay. Here we assume that the benefit function of the government-owned firm is  $U(Y) = uY$ , and the cost function of the seller is  $D(Y) = dY$ . Since the government owned firm has  $A^G$  at time 3, it has to borrow  $(PY - A^G)$  from the seller. On the other hand the seller can expect to get only  $suY$ , where  $s$  is the enforcement technology of the seller. Hence we get that the equilibrium trade volume becomes  $Y^* = \frac{A^G}{d - su}$ .

An interesting point is this trade volume and the trade credit from the seller to the government-owned firm are dependent upon the enforcement technology of the government owned firm,  $s^G$ . To prove this point, we rewrite  $Y^*$  as follows,

$$Y^* = \frac{A^G}{d - su} = \frac{c}{(c - s^G v)(d - su)} A.$$

Hence we can easily see that  $Y^*$  is an increasing function of  $s^G$ . The equilibrium trade credit from the seller to the government-owned firm is  $suY^* - A^G$ , that is

$$suY^* - A^G = \frac{suA^G}{d - su} - A^G = \frac{d}{d - su} A^G = \frac{d}{(c - s^G v)(d - su)} A.$$

Thus even the equilibrium trade credit is an increasing function of  $s^G$ .

**Proposition III.2** The equilibrium trade volume and trade credit from a seller to a government-owned firm are increasing functions of the enforcement technology of the government-owned firm  $s^G$ .

This proposition shows that the enforcement technology has an externality effect. Furthermore we can easily show that there is a positive externality effect even to the seller since the upfront cash for the seller is increased by an increase of  $s^G$ . This means the transaction between another seller and this seller can be improved by the increase of  $s^G$ .

This observation suggests that if the government-owned firms in China have better enforcement technologies than privately-owned firms, those enforcement technologies have positive effects for promoting total transactions and increase trade credits in China.

### III.3 Behavior of Government-Owned Firms

In the previous subsection, we have assumed that the government-owned firms have better enforcement technologies. There is a possibility, however, that they do not have better technology but they expand their trade credits just because of laziness or other agency problems. Thus we examine this possibility.

Let us consider the sequential trading model in the previous subsection. Suppose  $s^G$  is very low, but the government-owned firm is irrational and expanded the total sales, that is  $X^* > A/(c - s^G v)$ . In this case, the trade credit from the government-owned firm to the buyer can be high, since the trade volume is high. In this case, however, the government-owned firm cannot get sufficient return at time 2, since the lending is irrational. Hence  $A^G$  must become very low. Therefore, the total sales and trade credit from the seller to the government-owned firm must be very low level. In summary, the trade credit from government-owned firm to privately-owned firms can be increased by irrational behaviors of government-owned firms but the trade credit from privately-owned firms to government-owned firms and privately-owned firms to privately owned firms must be decreased by the irrational behaviors.

## IV Data

In the following 3 sections starting from this, we will examine three competing hypotheses on the role of trade credits offered by government-owned firms, namely:

- a. Government-owned firms have a superior enforcement technology, thereby expanding the volumes of trade credits in the economy.
- b. Government-owned firms have an inferior enforcement technology, thereby shrinking the volume of trade credits in the economy.
- c. Government-owned firms have an inferior enforcement technology, but they act irrationally and expand the volume of trade credits.

The first of these have been set forth in the previous subsections as the leading case. The rest is also consistent with the model we developed.

In what follows, we will point that government-owned firms engage actively in trade credit financing, both at lending and borrowing, which rejects the hypothesis b. We will then show in the discussion, to distinguish between the hypotheses a and c, that rates of nonperforming loans are not significantly different between government- and nongovernment-owned firms, nor is maturity of loans offered by them. We also observe that lending from nongovernment-owned to government-owned firms is frequent and large (relative to trade volume). Therefore we conclude that the hypothesis a to be most likely.

### IV.1 General Characteristics of the Sampled Firms

Our sampled firms are classified into several ownership types: state-owned, quasistate-owned, government-supervised, and privately-owned. The state-owned firms are firms whose capital is fully

owned by the government. The quasistate-owned firms are either collectively owned or whose majority share holder is a government holding company. The state-supervised firms are private firms that are under supervision of local government. The private firms are all other firms.

The financial statistics of firms show that state-owned firms are large in size. **Table 3** indicates the state-owned firms are at least three times as large in median as other types in terms of total assets. Liquidity ratio, or the ratio of liquid assets to liquid liabilities, measures the liquidity of firms. As a rule-of-thumb it is generally considered 2 as a sound liquidity position of firms. The sampled firms have lower values, mostly around between 1 and 1.5, and its median value is lowest for the privately-owned firms.<sup>\*2</sup> It is interesting that, when we look at the median firms, the privately-owned firms are the least sound in terms of liquidity ratio. State supervision, on the other hand, may not seem to help firms to act more prudently, although there is more heterogeneity in private and state-supervised firms than other types as the large standard deviation shows. The median profit margin is about the same for all types, although, there is more heterogeneity in state-owned firms that there are a few firms which have negative profits.

## IV.2 Trade Credit Transactions

For trade credit transactions, we focus on whether state and quasistate ownership, or government ownership in general, result in different patterns and thence effects on the local economy. As explained in the previous sections, this follows from our casual observation that the transition problem arises from a combination of both development of market institutions and evolution of government involvement in economic activities. So we will classify the firm ownership into government-owned (state-owned and quasistate-owned) and nongovernment-owned (state-supervised and privately-

**Table 3: Selected Financial Indicators of Firms by Ownership Types**

		state owned	quasistate owned	state supervised	private
total asset (10 million yuan)	median	4.49	1.32	1.52	1.27
	mean	7.75	2.31	2.29	1.96
	std dev	11.06	2.18	3.03	2.25
liquid assets/total asset (%)	median	0.48	0.48	0.43	0.41
	mean	0.42	0.47	0.44	0.56
	std dev	0.27	0.34	0.22	0.75
liquid liabilities/total asset (%)	median	0.38	0.44	0.55	0.48
	mean	0.46	0.70	0.55	0.65
	std dev	0.32	0.73	0.27	0.88
liquidity ratio	median	1.01	1.09	0.86	0.85
	mean	1.02	1.06	1.56	1.20
	std dev	0.39	0.76	4.37	1.36
total profit/total asset (%)	median	0.02	0.02	0.01	0.02
	mean	-0.12	0.05	0.03	0.10
	std dev	0.42	0.10	0.08	0.36
number of observations		10	9	61	29

Note:

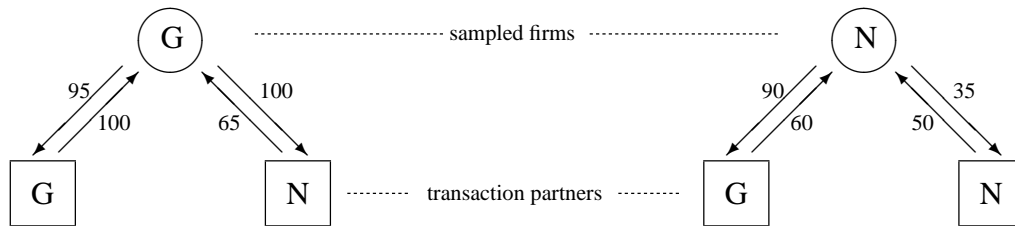
<sup>\*2</sup>Mean value of state-supervised firms is the highest among all ownership types, however, mean is not robust to outliers, which is shown in the large standard deviation. We will therefore focus on median.

**Table 4: Borrowing, Lending, and its Maturity among Different Ownership Types**

sampled firm	partner firm	min	median	max	mean	st dev	NA	n	
lender	borrower	PROPORTION OF LENDING							
		government-owned	0	95	100	72.00	40.50	2	12
		nongovernment-owned	0	100	100	69.42	36.23	2	28
		nongovernment-owned	0	35	100	44.43	40.04	7	117
lender	borrower	MATURITY OF LENDING (DAYS)							
		government-owned	7	30	60	34.20	16.59	2	12
		nongovernment-owned	1	30	60	21.89	15.48	2	28
		nongovernment-owned	1	30	180	30.95	31.31	8	117
borrower	lender	PROPORTION OF BORROWING							
		government-owned	0	100	100	70.77	45.91	5	18
		nongovernment-owned	0	65	100	52.90	45.01	6	25
		nongovernment-owned	0	50	100	48.25	43.02	20	135
borrower	lender	MATURITY OF BORROWING (DAYS)							
		government-owned	7	15	45	21.46	14.10	5	18
		nongovernment-owned	1	12	30	16.35	12.38	8	25
		nongovernment-owned	1	23	90	22.83	19.86	16	58
borrower	lender	MATURITY OF BORROWING (DAYS)							
		government-owned	7	15	45	21.46	14.10	5	18
		nongovernment-owned	1	12	30	16.35	12.38	8	25
		nongovernment-owned	0	20	111	21.15	18.32	25	135

Note: Average of top in-the-city and top out-of-city transactions as proportions to value of each transactions (in per cent). Government-owned firms are state-owned and quasistate-owned firms. Non-government-owned firms are all other firms. Quasistate-owned firms are collective firms and firms whose majority share holder is public holding company. State supervised firms are under supervision of local government. Private firms are all other firms.

**Figure 2: Median Credit Flows between Firms**



Note: G is government-owned, N is nongovernment-owned firms. Circled firm is the sampled firm, squared firms are its transaction partners. Arrows indicate direction of credit flows, and lending is through sales and borrowing is through procurement. Values indicate median proportion of credit in each transactions.

owned). A corollary to government involvement in economic activity is the effects of municipal borders on trade credits. Partly out from altruistic consideration, partly out from a desire to share the rents from protection, local governments often favor local firms by invoking some *ad hoc* principles in dispute settlements, which create a barrier in trade across municipalities. We will therefore distinguish whether transactions stay within the border or go beyond it, ‘in-the-city’ and ‘out-of-city’ in our terminology.

If we look into the payment of transactions, there are a few differences in lending and borrowing through trade credits by ownership types.<sup>\*3</sup> **Table 4** summarizes borrowing in procurement and lending in sales transactions, against government-owned and non-government-owned firms. **Figure 2** shows the median credit flows for government- and nongovernment-owned firms against both government- and nongovernment-owned firms.

<sup>\*3</sup>Borrowing in sales (prepayment) and lending in procurement (prepayment) are less prevalent, and the net effects are lending in sales and borrowing in procurement. So we will not consider these transactions.

One can see that the government-owned firms use more borrowing and lending. In median, government-owned firms lend at 95 and 100 per cent towards government- and nongovernment-owned firms, respectively, while nongovernment-owned firms lend at 90 and 35 per cent, respectively. Results are similar in borrowing, that government-owned borrows from government- and nongovernment-owned at 100 and 65 per cent, respectively, whereas the corresponding numbers for nongovernment-owned are 60 and 50. Thus lending through postpayments in sales operations is also more frequent among government-owned firms, especially against non-government-owned firms. Borrowing through postpayments in procurement operations is generally more frequent with government-owned firms, especially against government-owned firms.

In **Table 4**, maturity of trade credits has the same median values for both types of firms in lending operations. We see a larger variability among nongovernment-owned firms, with standard deviation about twice or more than the government-owned firms. This is partly because some of them lend in longer maturity of 180 days while the government-owned firms maxes out at 60 days. In borrowing operations, government-owned firms receive shorter maturity credits. The difference in standard deviations between two types of firms are not as large as in lending. So maturity data suggests a general pattern that government-owned firms lend longer and borrow shorter. Credit contents of transactions show they lend and borrow more.

This is somewhat inconsistent with the popularly held notion that government-ownership involves strong-arm tactics and renegeing on debts. Rather, it suggests the otherwise that they not just actively engage in trade credit financing and follow contractual agreements relatively well whenever they borrow, but also offer credits in more generous terms. Such a characterization is more suited to efficiency than strong-arm tactics.

## V Estimation

To confirm above results in detail, we first use FGLS to run a two-equation system of borrowing  $y_{b,i}$  and lending  $y_{l,i}$  of firms, and evaluate the estimates using robust standard errors (Wooldridge [2003:7.49]).

$$y_{k,i} = \alpha'_k \mathbf{d}_{k,i} + \beta'_k \mathbf{x}_{k,i} + e_{k,i}, \quad k = b, l$$

where  $\mathbf{d}_{k,i}$  is a vector of ownership dummies of respondent firms interacted with dummies indicating whether the partner is located in the city or out of city,  $\mathbf{x}_{k,i}$  is a vector of controls such as industry dummies (manufacturing, distribution/retail, partner is manufacturing), a dummy variable indicating if the product being traded is considered to be ‘unique’ by the respondent firm, a dummy variable if the respondent considers there is a rival firm to the respondent. Uniqueness, rivalry, and years of transactions are included to control for market power of the firms. We expect uniqueness to have a positive estimate as it increases the costs of defaults. Rivalry will undermine the reputation built on long-term relationship, because either party has an outside option. Years of transactions is not a forward-looking variable thus does not necessarily predict less defaults, however, the fact that the relationship lasted longer can imply that switching to other trade partners will be costly. So we expect a positive estimate on the last variable.

It is probably necessary to include total sales and total purchase of firms in each regressions to

control for the size effects on trade credits. As transaction is considered to be endogenous, we need instruments. However, it is difficult to find valid instruments, and we decided not to include these variables.<sup>\*4</sup> Firm asset sizes or other size proxies may be argued to serve as instruments, however, the past choices of the largest transaction partners and the use of trade credits in them should have, at least, some effects on firm growth, which nullify the validity requirement of instrumental variables.

To control for the size effects, next, we use ratios of lending and borrowing  $y_i \in [0, 1]$  in each transactions as regressand, where we dropped  $l$  subscript. As  $y_i$  is a limited dependent variable, one cannot use OLS to consistently estimate the parameters of interest. As it is a continuous variable, we lose information if we use discrete response models. We will thus use the fractional logit model that gives consistent estimates of parameters in continuous limited-dependent variable regressions (as discussed in Papke and Wooldridge, 1996). It is based on the theory of quasi-maximum likelihood estimation (QMLE), and we maximize the Bernoulli likelihood of:

$$l_i(\boldsymbol{\gamma}) = y_i \ln [G(\boldsymbol{\gamma}'\mathbf{z}_i)] + (1 - y_i) \ln [1 - G(\boldsymbol{\gamma}'\mathbf{z}_i)],$$

where  $G(a) = \frac{1}{1+e^{-a}}$ ,  $\mathbf{z}_i = (\mathbf{d}'_i \quad \mathbf{x}'_i)'$ ,  $\boldsymbol{\gamma} = (\boldsymbol{\alpha}' \quad \boldsymbol{\beta}')$ . Robust standard errors are obtained from square roots of diagonal elements in

$$\hat{\mathcal{V}}[\boldsymbol{\gamma}] = \hat{\mathbf{A}}^{-1} \hat{\mathbf{B}} \hat{\mathbf{A}}^{-1} / n,$$

where  $n$  is sample size and

$$\hat{\mathbf{A}} = \sum_{i=1}^n \frac{\hat{g}_i^2}{\hat{G}_i(1 - \hat{G}_i)} \mathbf{z}'_i \mathbf{z}_i, \quad \hat{\mathbf{B}} = \sum_{i=1}^n \left( \frac{\hat{u}_i \hat{g}_i}{\hat{G}_i(1 - \hat{G}_i)} \right)^2 \mathbf{z}'_i \mathbf{z}_i,$$

and  $\hat{G}_i = G(\hat{\boldsymbol{\gamma}}'\mathbf{z}_i)$ ,  $g(a) = \frac{\partial G(a)}{\partial a}$ ,  $\hat{g}_i = g(\hat{\boldsymbol{\gamma}}'\mathbf{z}_i)$ , and  $\hat{u}_i = y_i - \hat{G}_i$ .

## VI Estimated Results

When we regress amount of lending and borrowing through trade credits on ownership types and other control variables, government-owned firms are shown to be actively engaged in trade credit financing. **TABLE 5** shows the estimated results. The columns (1) and (4) are the base regressions that include only ownership and location dummies. (2) and (5) add industry dummies, and (3) and (6) further add characteristics of market competition. The default lending pattern is nongovernment-owned to nongovernment-owned.

As can be seen, lending by nongovernment-owned firms to government-owned firms is greater than the default lending pattern. Borrowing by government-owned firms from government-owned firms are also shown to be greater than the default. The out-of-city dummies are generally negative, indicating they lend or borrow less in out-of-city transactions, but they are not statistically significant.

In **TABLE 6**, we have distinguished in-the-city and out-of-city transactions for each ownership types. The results show that nongovernment-owned lends more to government-owned for in-the-city trades, although the difference over the corresponding government-owned lending to government-owned in-the-city trades are not significant in most cases (test statistics are not shown). In borrowing,

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<sup>\*4</sup>Preceding research simply includes these variables without consideration of endogeneity (Rajan and Zingales [1997], McMillan and Woodruff [1999], Johnson, McMillan and Woodruff [2002]).

government-owned firms are receiving credits from the peer, government-owned firms in-the-city, whose differences over borrowing of nongovernment-owned from in-the-city government-owned firms are statistically significant. This confirms the previous observation we found using the descriptive statistics. The overall differences between all (gov-nongov) trades and all (nongov-nongov) trades give significant  $p$  values, so do the stronger rejection of the null of '(gov-gov)-(nongov-gov), in is zero'. One also notes the negative estimates on out-of-city dummies that show smaller lending and borrowing relative to in-the-city transactions.

These results, despite revealing interesting patterns, are not precisely estimated in two senses; first in large standard errors, second in not being able to control for the size of transactions, which should generate omitted variable biases in the unknown direction.

In **TABLE 7**, we turn to credit ratios by using fractional logit models to control for the transaction sizes. We have used lending ratios, or the proportion of postpayments, in sales, and borrowing ratios, or the proportion of postpayments, in procurement. We find that, lending ratios are greater (a) between government-owned firms, and (b) from nongovernment-owned to government-owned firms. In borrowing, most of the estimates are imprecisely estimated. However, point estimates show that borrowing between government-owned, and borrowing of government-owned from nongovernment-owned are positive, which are consistent with (a) and (b), respectively. We note that, compared to (2), out-of-city dummy becomes significantly positive but smaller, when we add market power variables in specification (3). This indicates lending ratios offered to out-of-city partners are positively correlated with these market power variables. This is reasonable when we look at point estimates of uniqueness of the product and years of transactions, as they would enhance reputation through greater costs of defaults and greater incidence of non-defaults. The positive sign of rival is puzzling as we expect rivalry undermines reputation. This may be capturing the effects of competition, which may not be compatible with a Pareto-superior equilibrium where lenders offer more credits and borrowers default less (relative to a Pareto-inferior one where lenders offer less credits and borrowers default more often). The estimates on market power variables are, however, all insignificant at conventional levels.

In **TABLE 8**, the distinction between in-the-city and out-of-city transactions are considered explicitly. This shows lending ratios are greater for (c) government-owned firms to in-the-city partners, and borrowing ratios are greater for (d) government-owned firms from in-the-city partners. These confirm that government-owned firms are generally active in extending and receiving credits for in-the-city trades. The estimate on out-of-city dummy in (3) has also similar values and result as in **TABLE 7**.

When we use the more detailed classification of trades, we can generally confirm the finding of (a) to (d), but in a more specified manner. In **TABLE 9**, we distinguished ownership types and destination of transactions. We see that government-owned firms lend more to out-of-city government-owned partners than nongovernment-owned firms, which we previously identified as (a). Government-owned firms lend more also to nongovernment-owned firms in-the-city, which corresponds to finding (c). Nongovernment-owned firms lend more to government-owned firms in-the-city, which is basically same as finding (b). Both types of firms do not lend aggressively to nongovernment-owned firms out-of-city (relative to the default of between nongovernment lending in-the-city), as estimates



are all not significantly different from zero. The statistically significant and large borrowing ratios between government-owned firms in-the-city are notable. This is a reconfirmation of finding (d). Finding (d) is also consistent with positive and significant estimates on borrowing of government-owned from nongovernment-owned in-the-city, although the size of estimates is smaller. The out-of-city dummy in (3) again gives similar values as in TABLE 7, indicating a robust positive correlation between lending ratios and market power variables. The overall  $\chi^2$  tests on equality in all gov variables and corresponding nongov variables are rejected.

**Table 5: Estimated Results of Lending in Sales and Borrowing in Procurement**

	Lending in Sales (10 thousand yuan)			Borrowing in Procurement (10 thousand yuan)		
	(1)	(2)	(3)	(4)	(5)	(6)
intercept	244.654*** (94.706)	42.515 (134.492)	-38.692 (161.841)	158.987*** (47.336)	150.687** (65.873)	237.582** (116.143)
government-government	-30.588 (91.330)	43.423 (102.838)	19.851 (119.484)	118.280* (79.408)	145.434** (86.374)	89.775* (65.577)
government-nongovernment	-55.876* (42.314)	-22.982 (52.890)	-38.860 (57.223)	-68.002** (39.206)	-60.343* (40.724)	-32.053 (54.792)
nongovernment-government	236.079** (119.075)	186.293** (98.647)	199.710* (125.206)	46.940 (44.308)	55.418 (47.209)	17.312 (43.681)
out of city	-103.051 (112.179)	-106.486 (115.341)	-110.953 (119.362)	-30.358 (54.780)	-26.188 (56.667)	-9.020 (48.627)
manufacturing		154.834** (70.881)	163.950** (90.961)		37.603 (45.843)	37.757 (41.512)
partner is manufacturing		192.909* (122.782)	155.663 (148.804)		-32.148 (50.852)	-5.267 (49.048)
distribution/retail		57.712 (75.628)	55.241 (88.200)		-31.240 (57.474)	-14.592 (46.230)
unique			85.175 (141.606)			
rival			-1.282 (107.599)			-174.146** (104.942)
length			10.247 (8.765)			6.744* (4.187)
(gov-gov)-(nongov-gov)	0.930*	0.785	0.850	0.610	0.682	0.711
obs	172	172	170	170	161	161

Note: FGLS estimates. Default ownership is nongovernment-owned. *p* values are reported in (gov-gov)-(nongov-gov) differences.

**Table 6: Estimated Results of Lending in Sales and Borrowing in Procurement to In-The-City and Out-Of-City Firms**

	Lending in Sales			Borrowing in Procurement		
	(1)	(2)	(3)	(4)	(5)	(6)
intercept	228.588*** (90.91)	33.681 (139.142)	-71.123 (167.232)	192.260*** (53.202)	192.349*** (74.178)	241.602** (117.65)
government-government, in	144.274 (126.485)	197.101* (145.692)	213.579 (176.492)	280.128*** (42.444)	320.748*** (71.098)	223.005*** (61.123)
government-government, out	-191.859*** (57.06)	-43.811 (112.978)	32.663 (117.744)	152.478 (138.983)	158.595 (151.701)	70.045 (105.527)
government-nongovernment, in	11.551 (35.774)	52.064 (64.989)	38.165 (70.995)	-25.626 (55.981)	-16.972 (63.270)	26.327 (55.697)
government-nongovernment, out	-17.150 (43.345)	21.594 (76.140)	-37.599 (66.501)	-166.730*** (42.769)	-158.673*** (55.659)	-173.873*** (63.757)
nongovernment-government, in	577.599*** (244.844)	539.140*** (224.224)	531.046** (252.12)	58.114 (70.867)	43.555 (62.470)	70.023 (75.375)
nongovernment-government, out	197.691* (138.227)	154.012 (127.642)	191.452 (172.325)	53.335 (71.292)	65.633 (79.425)	57.894 (57.710)
nongovernment-nongovernment, out	58.030 (51.318)	46.160 (54.730)	18.140 (58.979)	-74.000* (48.894)	-75.879* (48.948)	-74.346* (45.261)
out of city	-138.292 (111.037)	-141.288 (115.729)	-125.121 (119.124)	-30.098 (54.562)	-29.869 (56.154)	-16.347 (47.740)
manufacturing		149.948* (92.024)	181.691* (113.472)		21.922 (51.687)	21.054 (45.315)
partner is manufacturing		183.943* (119.799)	150.443 (143.562)		-10.584 (44.844)	2.435 (44.532)
distribution/retail		44.422 (73.614)	20.979 (84.659)		-36.188 (59.275)	-36.827 (45.504)
unique			23.096 (147.051)			
rival			8.679 (99.492)			-139.320* (103.57)
length			11.772* (8.461)			7.694** (4.172)
(gov-gov)-(nongov-gov), in	0.883	0.810	0.783	1.000***	0.999***	0.914*
(gov-gov)-(nongov-gov), out	0.993***	0.849	0.626	0.508	0.431	0.090
(gov-nongov)-(nongov-nongov), out	0.811	0.223	0.504	1.000***	0.865	0.916*
obs	172	172	170	170	161	161

Note: FGLS estimates. Default transaction type is nongovernment-nongovernment, in-the-city transactions.

**Table 7: Estimated Results of Ratios of Lending in Sales and Borrowing in Procurement, Fractional Logit Models**

	Lending Ratio in Sales (per cent)			Borrowing Ratio in Procurement (per cent)		
	(1)	(2)	(3)	(4)	(5)	(6)
intercept	0.024 (0.212)	-0.378 (0.424)	-1.159 (0.580)	0.346* (0.253)	0.120 (0.507)	0.493 (0.659)
government-government	1.299** (0.594)	1.465*** (0.738)	1.516** (0.746)	0.458 (0.568)	0.825 (0.703)	0.830 (0.736)
government-nongovernment	0.533* (0.392)	0.598* (0.439)	0.430 (0.457)	0.172 (0.627)	0.289 (0.605)	0.277 (0.608)
nongovernment-government	0.601** (0.284)	0.580** (0.308)	0.445* (0.306)	-0.115 (0.331)	-0.019 (0.346)	-0.135 (0.358)
out of city	-0.114 (0.252)	0.232 (0.348)	0.065*** (0.025)	0.095 (0.297)	-0.207 (0.384)	-0.015 (0.024)
manufacturing		-0.154 (0.257)	-0.152 (0.265)		0.130 (0.306)	0.127 (0.314)
partner is manufacturing		0.304 (0.377)	0.594* (0.407)		0.481 (0.435)	0.570 (0.447)
distribution/retail		0.210 (0.379)	0.132 (0.398)		-0.342 (0.396)	-0.293 (0.397)
unique			0.136 (0.369)			
rival			0.073 (0.310)			-0.109 (0.404)
length			0.272 (0.430)			-0.373 (0.514)
(gov-gov)-(nongov-gov)	0.787	0.728	0.779	0.803	0.846	0.875

Note: Fractional logit estimates with response  $y_i \in [0, 1]$ , where we divided borrowing and lending with sales and purchase, respectively. A Bernoulli log-likelihood with  $l_i(\beta) = y_i \ln[G(\beta'x_i)] + (1 - y_i) \ln[1 - G(\beta'x_i)]$  where  $G(a) = \frac{1}{1+e^{-a}}$  is maximized. Robust standard errors are in parentheses. \*, \*\*, \*\*\* indicates significance at 10%, 5%, 1%, respectively. (gov-gov)-(nongov-gov) shows  $p$  values for the test of equal estimates. Default transaction type is nongovernment-owned firms in-the-city.

**Table 8: Estimated Results of Ratios of Lending in Sales and Borrowing in Procurement, Fractional Logit Models**

	Lending Ratio in Sales (per cent)			Borrowing Ratio in Procurement (per cent)		
	(1)	(2)	(3)	(4)	(5)	(6)
intercept	0.276 (0.217)	0.087 (0.405)	-0.841 (0.552)	0.572** (0.264)	0.393 (0.523)	0.443 (0.689)
government, in	0.963** (0.419)	0.962** (0.475)	0.839** (0.497)	2.118*** (0.564)	2.265*** (0.691)	2.170*** (0.698)
government, out	-0.150 (0.496)	-0.246 (0.526)	-0.552 (0.544)	-0.927 (0.607)	-0.671 (0.686)	-0.824 (0.704)
nongovernment, out	0.132 (0.273)	0.123 (0.280)	-0.023 (0.290)	-0.518 (0.308)	-0.545 (0.318)	-0.706 (0.330)
out of city	-0.196 (0.248)	0.255 (0.323)	0.062*** (0.024)	-0.028 (0.291)	-0.110 (0.395)	0.009 (0.024)
manufacturing		-0.211 (0.253)	-0.253 (0.260)		0.065 (0.301)	0.078 (0.316)
partner is manufacturing		-0.080 (0.358)	0.166 (0.373)		0.376 (0.417)	0.483 (0.421)
distribution/retail		0.461* (0.332)	0.456* (0.347)		-0.282 (0.386)	-0.176 (0.394)
unique			0.312 (0.347)			
rival			0.037 (0.301)			0.022 (0.407)
length			0.460 (0.402)			-0.184 (0.502)
govout-nongovout	0.493	0.564	0.588	0.164	0.737	0.160

Note: See Table 7.

**Table 9: Estimated Results of Ratios of Lending in Sales and Borrowing in Procurement, Fractional Logit Models**

	Lending Ratio in Sales (per cent)			Borrowing Ratio in Procurement (per cent)		
	(1)	(2)	(3)	(4)	(5)	(6)
intercept	-0.065 (0.253)	-0.452 (0.434)	-1.296 (0.598)	0.577** (0.305)	0.757 (0.617)	1.064* (0.752)
government-government, in	1.411* (0.921)	1.516* (1.043)	1.592* (1.038)	15.665*** (0.755)	15.798*** (0.885)	15.595*** (0.936)
government-government, out	3.071*** (0.738)	3.241*** (0.821)	3.167*** (0.888)	-0.512 (0.824)	-0.458 (0.898)	-0.565 (0.921)
government-nongovernment, in	0.993** (0.439)	1.058** (0.485)	0.933** (0.550)	1.780*** (0.578)	1.910*** (0.695)	1.802*** (0.703)
government-nongovernment, out	0.205 (0.564)	0.247 (0.630)	-0.143 (0.613)	-3.160 (0.952)	-2.979 (1.100)	-3.127 (1.168)
nongovernment-government, in	0.846** (0.423)	0.811** (0.418)	0.645* (0.394)	0.454 (0.583)	0.444 (0.609)	0.136 (0.617)
nongovernment-government, out	0.772** (0.427)	0.713* (0.440)	0.486 (0.454)	-0.085 (0.446)	0.048 (0.459)	-0.147 (0.474)
nongovernment-nongovernment, out	0.234 (0.329)	0.212 (0.338)	0.052 (0.354)	-0.869 (0.379)	-0.984 (0.413)	-1.126 (0.427)
out of city	-0.120 (0.253)	0.239 (0.346)	0.067*** (0.026)	0.139 (0.307)	-0.620 (0.455)	0.002 (0.023)
manufacturing		-0.155 (0.260)	-0.150 (0.266)		0.154 (0.316)	0.131 (0.326)
partner is manufacturing		0.267 (0.378)	0.540* (0.412)		0.305 (0.449)	0.371 (0.454)
distribution/retail		0.283 (0.366)	0.245 (0.379)		-0.512 (0.434)	-0.440 (0.436)
unique			0.207 (0.367)			
rival			0.028 (0.319)			-0.503 (0.473)
length			0.378 (0.434)			-0.340 (0.502)
all (gov vs. nongov)	0.992***	1.000***	0.987**	1.000***	0.974**	1.000***

Note: *p* values are shown in all (gov vs. nongov) for a test of all coefficients on gov variables are the same with respective nongov variables. Default transaction type is between nongovernment-owned in-the-city.

## VII Discussions and Conclusions

The estimated results that government-owned firms actively engage in trade credit financing can be interpreted in two ways: the government-owned firms are incapable of managing efficiently and employ lax trade credit policies, thus they lend and borrow more, or the government-owned firms are more efficient in enforcing contracts that they can safely lend and borrow more.

We will argue that it is likely that enforcement by government-owned firms are not less effective, and probably more effective, relative to nongovernment-owned firms. This conjecture is consistent with anecdotes that government-owned firms use ties with local government in their economic ac-

**Table 10: Differences in Group Means of Existence of Bad Loans by Ownership**

	government-owned	nongovernment-owned
median	1.000	1.000
mean	0.579	0.756
difference		-0.177
<i>p</i> value		0.171
weighted median	0.594	1.435
weighted mean	10.593	5.336
difference		5.257
<i>p</i> value		0.611

Note: Difference in means and weighted means of existence of unrepaid trade credits in the last three years. *p*-values of Welch's *t*-test for the null of equality in means with unequal variances are in parentheses. Weights are inverse of total sales, so the means are normalized with sales size. Weighted medians also use the same weights.

**Table 11: Differences in Group Means of Deviations in Credit Maturity Offered by Sampled Firms**

	government-owned	nongovernment-owned
	to government-owned firms	
median	0.000	0.000
mean	5.833	-11.813
difference		17.646
<i>p</i> value		0.214
	to nongovernment-owned firms	
median	0.000	0.000
mean	1.667	-9.840
difference		11.507
<i>p</i> value		0.240

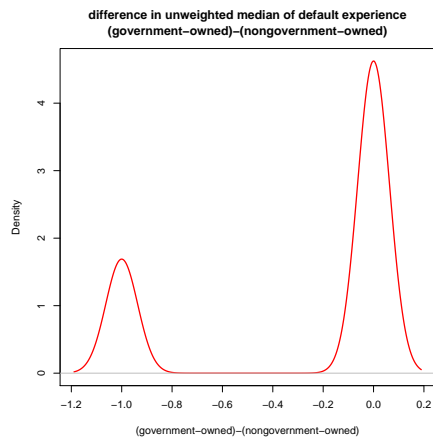
Note: For each firms, a difference in maturity to the top customer over firm's average maturity in all lending transactions is computed, and then group means are taken. *p*-values of Welch's *t*-test for the null of equality in means with unequal variances are in parentheses.

tivities. If we accept this view, it is interesting to note that government-owned firms do not seem to have sufficiently large leverage to extend their lending beyond borders: they do not lend or borrow as much as they do with in-the-city clients. This implies that the enforceability of contracts by government-owned firms does not extend beyond the administrative boundaries. This is consistent with their ties with government being mostly of local nature.

Note that it can, in principle, also be consistent with an interpretation that greater engagement in trade credits by the government-owned firms is due to their smaller bargaining powers of *vis-a-vis* their trading partners. So let us take a look at if the firms have bad loans in the past three years, as it should give some information on deterrence of willful defaults or so-called *ex post* moral hazard. **Table 10** examines the differences in medians, means, weighted medians, and weighted means of loan defaults in both types of firms. Weights are inverse of firms' total sales. As one see, unweighted means show a smaller default experience of government-owned firms.

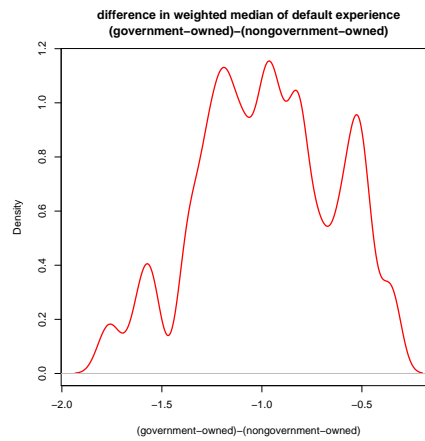
In weighted data, one sees that the weighted median of government-owned is less than a half of nongovernment-owned, indicating that government-owned firms are relatively less likely to experi-

**Figure 12: Differences in Median Bad Loan Experience by Ownership**



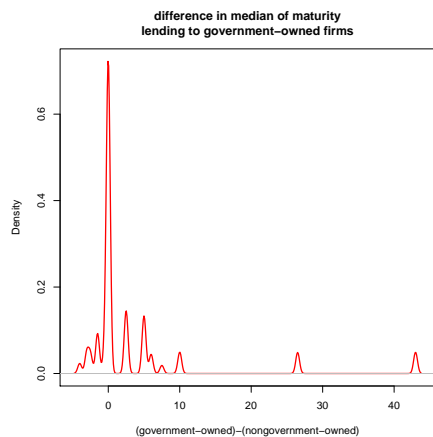
Note: Equals to 1 if the firm had at least one incidence of bad loan in the last 3 years, 0 otherwise. Thus raw data is binary. A density plot of bootstrapped distribution of unweighted median difference between government-owned and nongovernment-owned firms is shown. Number of repetition is 10000.

**Figure 13: Differences in Weighted Median Bad Loan Experience by Ownership**



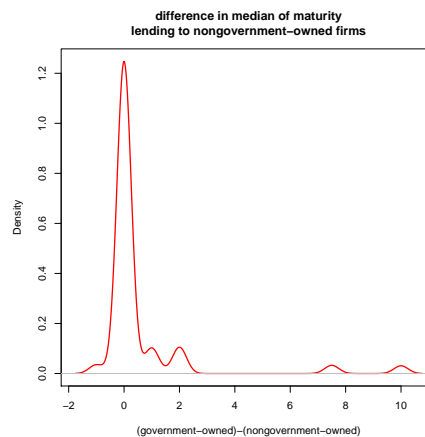
Note: Equals to 1 if the firm had at least 1 incidence of bad loan in the last 3 years, 0 otherwise. Then these values are weighted with an inverse of total sales of firms. Thus raw data is continuous. A density plot of bootstrapped distribution of weighted median difference between government-owned and nongovernment-owned firms is shown. Number of repetition is 10000.

**Figure 14: Differences in Median Lending Maturity Deviations to Government-Owned Firms**



Note: Deviation in lending maturity is defined as (lending maturity to the top government-owned customer)-(average lending maturity of the firm). A density plot of bootstrapped distribution of median lending maturity deviation differences between government-owned and nongovernment-owned firms, to government-owned customers is shown. Number of repetition is 10000.

**Figure 15: Differences in Median Lending Maturity to Nongovernment-Owned Firms**



Note: Deviation in lending maturity is defined as (lending maturity to the top nongovernment-owned customer)-(average lending maturity of the firm). A density plot of bootstrapped distribution of median lending maturity deviation differences between government-owned and nongovernment-owned firms, to nongovernment-owned customers is shown. Number of repetition is 10000.

ence defaults after adjusting for their greater transaction sizes. Note that the incidence of defaults is not restricted to the transaction with top customers, but refers to all transactions in the past 3 years. Thus it is not misleading to use total sales as weights in examining normalized (by size) frequency of defaults. Weighted means show the converse, as there is one influential observation in government-owned firms whose total sales is far smaller than the average (thus getting a very small denominator) and is experiencing defaults. All the  $p$  values indicate the differences are not significant.

We can see from more robust, median comparison that government-owned firms are relatively

better in enforcing contracts, although it is difficult to test it formally. As a work around, we have bootstrapped the differences in median and weighted median, i.e., we have resampled the data with replacements and have taken median differences. Negative values indicate nongovernment-owned firms experience more defaults in median. The number of repetition is set to 10000. The results for unweighted median differences are shown as a density plot in **Figure 12**, and results for weighted median differences are shown in **Figure 13**. One sees that in both weighted and unweighted median differences, government-owned firms clearly have fewer default experiences in median. It is also seen that the support of empirical distribution in the weighted median does not extend to positive values, while in the unweighted median difference cases, the support barely includes positive values.<sup>\*5</sup> This does not lend a support to a view that government-owned firms have smaller bargaining powers that they cannot effectively, relative to nongovernment-owned firms, enforce contracts.

**Table 11** examines the differences in medians and means of loan maturity for both types of firms. The  $p$  values indicate there are no significant differences in means. We ran a same resampling exercise with differences in median maturity deviation toward government-owned firms in **Figure 14** and to nongovernment-owned firms in **Figure 15**. Maturity deviation is defined as the difference maturity for top customer over average lending maturity of the firm. Subtraction of average maturity controls for the individual firm effects in lending. The results suggest maturity of government-owned firms may be longer, but not distinctively so relative to nongovernment-owned firms. There are, however, some cases that intragovernment-owned lending to be far longer than others.

Another evidence that lends a weak support, or nonrejection, to the efficiency interpretation is in **TABLE 11** where we show the Welch  $t$ -tests of difference in means of deviation of maturity. We first compute the deviation of maturity given to the top customer from average maturity given in all transactions, where the latter is given as an answer to the question on average maturity. Then we take group means and compare between groups. Government-owned firms generally give more maturity to the top customer (relative to firm average), while the nongovernment-owned firms do the converse. This tendency holds for both transactions with government-owned and nongovernment-owned customers. The  $p$  values are low and does not reject the null of equal deviations between groups, and thus does not give a decisive evidence against weak enforcement by the government-owned firms. However, the test results are statistically insignificant, and one should not overextend its implications.

It is widely recognized that trade credit is an important financial mechanism. In developing economies, it is a major financing source for economic activity. While enforcement of bank loan or formal credit is guaranteed by formal legal system and public powers, trade credits rely more on informal enforcement mechanism between trading partners. Thus, most of transition economies find themselves with mounting arrears in trade credits, because both formal and informal enforcement mechanisms have not been well established. This paper documents theoretical and empirical accounts on what facilitates an effective supply of trade credit under such circumstances. We find that government-owned firms play a significant role as a supplier of trade credits to both private and government sectors. We also find that incidence of nonperforming loans to be about the same in

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<sup>\*5</sup>The fact that the density plot goes beyond 0 into 0.2 is due to smoothing.

government and private sectors, indicating the former's enforcement is not less effective. We conclude that trade credits given by government-owned firms are a force behind the impressive growth of Chinese economy.

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## A Data

Data was collected at Yibin City, Sichuan Province, in January, 2003. Sample size is 120 with 112 effective responses, collected through interviews. We sampled 85 small and 18 medium scale firms from all industries without a randomization (Table A1). It sampled from most geographically approachable firms, thus there may be a selection that most marginally located firms are not included. However, there are 25 medium scale and 176 small scale firms in the area (*National Industrial Statistics*, 2002), so our sample has a considerable coverage among firms located not so far away from city center. We have oversampled medium scale firms to ensure we have sufficient observation of larger scaled, state-owned firms. Although the selection bias can be considered not to be serious, there may be a tendency that we overestimate the use of trade credits because geographically clustered firms may find it easier to extend and receive credits with nearby clusters than with remote firms. Such a selection bias is mostly controlled with the use of various ownership dummies. Thus we believe that our sample, despite its relatively small size, does not grossly misstate the actual activities of state-owned firms. As the state-owned firms are large in scale and small in numbers, our sample, collected from a single city, has a relatively small number of state-owned firms.

There are 10 state-owned firms, 9 quasistate-owned firms, 61 state-supervised firms, and 29 independent, private-owned firms, and 3 NAs for ownership type. State-owned firms are firms classified according to *State Owned Enterprises Law*. Quasistate-owned firms include collective firms, limited or incorporated companies whose majority share holders are government-owned holding companies. State-supervised firms consist of private-owned firms which has a supervisory authority in local government. A supervisory authority is an office that oversees firms and provide various kinds of assistances when needed. Privately-owned firms are all other firms. In Allen et al [2004]’s study, state-owned firms are classified as ‘formal’ sector, and all other types are classified as ‘informal’

**Table A1: Distribution of Total Assets, 2001**

size range	mean	std	obs
[16, 500]	250.42	146.10	22
(500, 2000]	1232.89	430.91	45
(2000, 4000]	2867.85	639.82	18
(4000, 36411]	8939.63	7610.78	18

Note: 103 firms gave total asset information. Asset size classification in *National Industrial Statistics* states small to be below 4000 yuan, medium to be above 4000 yuan and below 40000 yuan, large to be above 40000 yuan.

**Table A2: Definition of Ownership Types of Sampled Firms**

<i>state-owned</i>	firms classified as state-owned according to <i>State Owned Enterprises Law</i> .
<i>quasistate-owned</i>	collective firms, classified by <i>Town and Village Enterprise Law</i> , limited or incorporated companies whose majority share holders are government-owned holding companies.
<i>state-supervised</i>	private-owned firms which has a supervisory authority in local government.
<i>private-owned</i>	all other firms.

sector. We call the former two categories jointly as *government-owned*, and latter two jointly as *nongovernment-owned*.

When a firm sells a product with postpayment (late payment), the firm is offering credits. Conversely, when a firm buys a product with postpayment, it is receiving credits. Indices of trade credits we use are amount of late payments in procurement (borrowing), and late payments in sales transactions (lending). We have asked firms to provide information on the largest trading partners in sales and in procurement among within and outside the city boundary. City boundary distinction is used to capture if administrative boundaries matter for provision of trade credits. We thus have four observations of largest trading partners for each firms. We have also asked about ownership types of these trading partners. (Another measure of trade credits may be days after delivery required to settle account, but this measure turned out not to produce uniform results across ownership types in estimation.)

**Table A3: Definition of Variables**

<i>sales</i>	sales in 100 yuan to top selling firm
<i>manufact</i>	a dummy variable for partner firm being in manufacturing industry
<i>distretail</i>	a dummy variable for partner firm being in distribution or retail industries
<i>national</i>	a dummy variable for partner firm being government-owned
<i>unq</i>	a dummy variable for the good being designed specifically for sampled firm
<i>rival</i>	presence of competitors in the case of sales, and presence of alternative suppliers in the case of procurement
<i>length</i>	years of transaction with partner firm
<i>state</i>	a dummy variable for sampled firm being a state-owned firm
<i>qstate</i>	a dummy variable for sampled firm being either a collective firm or a firm whose majority share holder is a public holding company
<i>spoffice</i>	a dummy variable for sampled firm having a supervisory authority in local government
<i>pvt</i>	a dummy variable for sampled firm being private-owned
<i>tsales</i>	total sales in 10000 yuan of sampled firm in 2000
<i>manufact</i>	a dummy variable for presence of rival to sampled firms
<i>out</i>	a dummy variable for partner firm being located outside the city boundary
<i>proc</i>	procurement in 100 yuan from partner firm
<i>tprofitA</i>	total profit to total asset ratio
<i>cashA</i>	cash holdings to total asset ratio
<i>liqLA</i>	liquid liabilities to total asset ratio
<i>totA</i>	total assets in 10000 yuan
<i>amount</i>	amount in 10000 yuan borrowed from banks
<i>maturity</i>	maturity of bank loans in days
<i>irate</i>	interest charged by banks
<i>lgv*</i>	a set of dummy variables for what the firm expects from local government when in trouble. <i>lgvbk</i> indicates exerting an influence on banks' loan decisions, <i>lgvdspt</i> indicates intervention to disputes, <i>lgvbsdy</i> indicates subsidy, <i>lgvprsnel</i> indicates sending firms personnel, <i>lgvinfo</i> indicates sharing information.
<i>after<sub>s,c</sub></i>	an overall use in percentage of late payments by a sampled firm
<i>bkchk<sub>s,c</sub></i>	an overall use in percentage of bank checks for payments by a sampled firm
<i>bkplastic<sub>s,c</sub></i>	an overall use in percentage of credit cards for payments by a sampled firm

It is not always true that a trading partner who has a large share in firm's transactions exerts more bargaining power, because it is relative market power between firm and its partner that determines

distribution of bargaining powers<sup>\*6</sup>. Although one cannot claim that picking only the largest trading partners necessarily biases estimates, one should address a concern that effects of bargaining power of trading partners may be overestimated as we collect information of the largest trading partners in each categories. Ideally, trading partners should be sampled from a pool of potential partners, by noting that actual trading partners are chosen from this pool. However, there does not exist an official list of firms for each products nor it is practically possible to list all firms who has a capacity to supply products of certain characteristics. If we resort to the second best where we randomly select trading partners from actual trading partners, there will be a measurement error problem that firms may not record all transactions made in small amounts. Not only survey nonresponses reduce number of observations but nonrandomly placed nonresponses and measurement errors cancel significant portion of benefits of randomization. These considerations led us to pick the largest trading partners but with some caution. For cautionary measures, we have asked firms about market power in trade with partners, years of trade, and uniqueness of products, or the market power variables, which all are thought to affect distribution of bargaining powers, and included them in estimation.

**Table A4: Descriptive Statistics of Sales Transactions**

	<i>min</i>	10%	25%	<i>median</i>	75%	90%	<i>max</i>	<i>mean</i>	<i>std</i>	<i>0s</i>	<i>NAs</i>	<i>n</i>
days	0.00	3.00	10.00	30.00	35.00	66.00	180.00	32.23	34.46	1	0	81
cod	0.00	0.00	0.00	20.00	60.00	90.00	100.00	32.57	36.69	33	0	81
bef	0.00	0.00	0.00	0.00	10.00	20.00	100.00	6.79	15.09	57	0	81
after	0.00	0.00	20.00	70.00	100.00	100.00	180.00	61.63	42.23	13	0	81
manufact	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.47	0.50	43	0	81
distretail	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.30	0.46	57	0	81
national	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.38	0.49	50	0	81
sales	1.61	3.47	4.25	5.52	6.26	7.38	9.11	5.33	1.60	0	0	81
unq	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.33	0.47	54	0	81
rival	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.85	0.36	12	0	81
length	1.00	3.00	4.00	7.00	12.00	17.00	37.00	8.61	6.81	0	0	81
state	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.10	0.30	73	0	81
qstate	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.09	0.28	74	0	81
spoffice	0.00	0.00	0.00	1.00	1.00	1.00	1.00	0.59	0.49	33	0	81
pvt	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.22	0.42	63	0	81
tsales	0.00	0.02	0.05	0.09	0.17	0.31	0.95	0.15	0.17	0	0	81
manuf	0.00	0.00	0.00	1.00	1.00	1.00	1.00	0.74	0.44	21	0	81
tprofitA	-1.24	-0.02	0.00	0.01	0.03	0.07	0.27	0.01	0.15	0	0	81
cashA	0.00	0.01	0.02	0.04	0.07	0.14	0.54	0.06	0.08	0	0	81
liqLA	0.01	0.22	0.39	0.51	0.69	0.88	4.86	0.60	0.58	0	0	81
totA	0.00	0.02	0.08	0.16	0.30	0.64	3.64	0.29	0.48	0	0	81
lgvbk	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.43	0.50	46	0	81
lgvdspt	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.46	0.50	44	0	81
lgvsbsdy	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.05	0.22	77	0	81
lgvprsnel	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.12	0.33	71	0	81
lgvinfo	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.43	0.50	46	0	81
amount	0.00	0.01	0.01	0.03	0.06	0.13	1.00	0.07	0.14	0	19	81
irate	2.00	5.21	5.75	6.35	7.02	7.60	9.20	6.32	1.25	0	20	81
maturity	6.00	7.20	12.00	12.00	21.00	36.00	96.00	18.05	14.97	0	19	81

Note: med is an indicator for medium scale firms. Multiple answers are allowed in *lgvbk*, *lgvdspt*, *lgvsbsdy*, *lgvprsnel*, *lgvinfo*.

<sup>\*6</sup>For example, consider number of alternative trading partners as a fall back option in bargaining models.

**Table A5: Descriptive Statistics of Procurement Transactions**

	<i>min</i>	10%	25%	<i>median</i>	75%	90%	<i>max</i>	<i>mean</i>	<i>std</i>	<i>0s</i>	<i>NAs</i>	<i>n</i>
days	0.00	1.00	7.00	20.00	30.00	31.00	90.00	21.20	17.85	1	0	70
cod	0.00	0.00	0.00	20.00	90.00	100.00	100.00	38.29	42.49	30	0	70
bef	0.00	0.00	0.00	0.00	0.75	20.00	100.00	9.44	24.36	52	0	70
after	0.00	0.00	0.00	60.00	100.00	100.00	100.00	52.14	43.57	22	0	70
manufact	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.36	0.48	45	0	70
distretail	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.30	0.46	49	0	70
national	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.31	0.47	48	0	70
proc	0.59	2.97	3.81	4.94	5.79	6.69	8.75	4.78	1.59	0	0	70
rival	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.76	0.43	17	0	70
length	0.00	3.00	5.00	7.00	11.00	16.10	53.00	9.07	8.60	1	0	70
state	0.00	0.00	0.00	0.00	0.00	0.10	1.00	0.10	0.30	63	0	70
qstate	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.07	0.26	65	0	70
spoffice	0.00	0.00	0.00	1.00	1.00	1.00	1.00	0.59	0.50	29	0	70
pvt	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.24	0.43	53	0	70
tsales	0.00	0.02	0.05	0.09	0.16	0.30	0.95	0.15	0.18	0	0	70
manuf	0.00	0.00	0.00	1.00	1.00	1.00	1.00	0.69	0.47	22	0	70
tprofitA	-1.24	-0.01	0.00	0.01	0.04	0.08	0.27	0.01	0.16	0	0	70
cashA	0.00	0.01	0.02	0.04	0.07	0.15	0.30	0.06	0.06	0	0	70
liqLA	0.01	0.19	0.33	0.47	0.69	0.84	2.35	0.53	0.36	0	0	70
totA	0.00	0.03	0.08	0.15	0.29	0.64	3.64	0.29	0.51	0	0	70
lgvbk	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.44	0.50	39	0	70
lgvdspt	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.44	0.50	39	0	70
lgvsbsdy	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.03	0.17	68	0	70
lgvprnel	0.00	0.00	0.00	0.00	0.00	0.10	1.00	0.10	0.30	63	0	70
lgvinfo	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.41	0.50	41	0	70
amount	0.00	0.01	0.01	0.02	0.05	0.13	1.00	0.07	0.15	0	17	70
irate	2.40	5.30	5.79	6.54	7.20	7.78	15.00	6.60	1.67	0	18	70
maturity	6.00	6.20	12.00	12.00	24.00	36.00	96.00	18.23	15.65	0	17	70

Note: med is an indicator for medium scale firms.

**Table A4** and **Table A5** show descriptive statistics of trade credits in sales and procurement transactions, respectively. We have classified trading partners into government-owned and nongovernment-owned. The classification is less finer than our sampled firms because it is difficult to get detailed information on trading partners' exact ownership types, especially those of outside the city.

In sales transactions, we see that lending is predominant in all ownership types. This is especially so for state-owned firms and quasistate-owned firms. These firms provide more net credits than other ownership types through mostly postpayments to trading partners. While state-owned firms offer more credits to buyers, they also receive more credits from sellers as well. This can be seen by comparing when trading partner is a government-owned firm or not. Both **Table A4** and **Table A5** suggest sampled firms tend to offer more net credits to government-owned firms.

In procurement, borrowing is predominant. In particular, state-owned firms do not use prepayments at all. They at the same time receive more net credits than any other ownership types. Peculiarity of government-owned firms is also confirmed in procurement transactions that other ownership types offer more gross credits through prepayment to government-owned firms than to private-owned firms, while use more or less the same proportions of postpayments to government- and non-government- owned firms.

## B Descriptive Statistics on Differences in Borrowing and Lending

The importance of trade credits can be seen from the financial data of the firms. In the year 2000, accounts receivable and other supplier credits account for about 16% of their total assets at the median, which is more than twenty times of median fixed investments. Mean value is similar,

**Table B1: Trade Credits of the Firms as Ratios of Total Assets in 2000 and 2001**

	min	25%	median	75%	max	mean	st dev	0s	NAs	n
2000										
accounts receivable	0.000	0.005	0.032	0.056	0.329	0.054	0.083	1	97	112
other supplier credits	0.005	0.052	0.133	0.190	1.162	0.147	0.154	0	17	112
liquid assets	0.024	0.265	0.435	0.609	4.211	0.483	0.442	0	11	112
long-term investments	0.000	0.001	0.007	0.033	0.559	0.050	0.115	0	67	112
accounts payable	0.000	0.019	0.035	0.088	0.962	0.103	0.209	2	91	112
other customer credits	0.001	0.047	0.089	0.190	1.190	0.163	0.198	0	22	112
liquid liabilities	0.011	0.391	0.487	0.676	4.859	0.580	0.539	0	15	112
2001										
accounts receivable	0.000	0.002	0.009	0.053	0.182	0.038	0.058	3	94	112
other supplier credits	0.000	0.041	0.102	0.193	0.713	0.144	0.133	0	7	112
liquid assets	0.005	0.276	0.420	0.581	8.202	0.500	0.780	0	5	112
long-term investments	0.000	0.001	0.009	0.051	0.924	0.070	0.161	2	61	112
accounts payable	0.000	0.021	0.043	0.107	0.914	0.101	0.189	2	89	112
other customer credits	0.001	0.031	0.088	0.195	0.887	0.143	0.159	0	18	112
liquid liabilities	0.001	0.317	0.484	0.635	1.623	0.489	0.261	0	8	112

Note:

and the similar figures can be found in 2001. Accounts payable and other customer credits are about 11% of total assets at median, which is smaller than the mean of 26%. This shows that some firms use the customer credits more extensively than they use the supplier credits.