Revisiting the Determinants of Trade Credit: Evidence from 2003 Data

by

Hoi Kit Lo

An essay submitted to the Department of Economics
in Partial fulfillment of the requirements for
the degree of Master of Arts

Queen's University

Kingston, Ontario, Canada

August 2008

Abstract

Using cross-sectional survey data from the 2003 NSSBF, this paper revisits the determinants of trade credit use. We find that the smaller the firm and the higher its profits, the more trade credit is offered. Interestingly, we also find that the more money a firm is losing, the more trade credit is offered. The less purchases supplied on account, the higher the demand for trade credit. Smaller young firms that are facing negative sales growth and have been recently denied request for loan demand more trade credit than others.

Acknowledgements

Contents

List of Tables

1   Introduction

Trade credit refers to credit granted by a supplier to its customers. Accounts receivable accrue when firms sell on credit, and accounts payable are incurred when they purchase on credit. Trade credit is the single most important source of short-term external finance for firms in the United States (Peterson and Rajan 1997). According to Nilsen (2002), the share of accounts payable in total liability is about 13 percent for U.S. manufacturing firms, while Mian and Smith (1992) point out accounts receivable is 21 percent of total assets for a sample of manufacturing firms in Compustat. Others have highlighted the importance of trade credit in promoting the high growth rates of the Chinese economy.[1]

Trade credit is a relatively expensive form of financing, with implicit rate of over 40 percent if early-payment discounts are not taken advantage of. Two common trade credit terms are simple net terms and two-part terms. The former require full payment within a certain period after delivery, usually 30 days. The latter involves two-parts, in which a discount is offered if payment is made within the discount period, or full payment is required at the end of the net period. The most common two-part terms is a 2/10 net 30.[2] This means a two-percent discount is given if the buyer pays within 10 days of delivery, after that, the buyer has to pay the full amount by 30 days after delivery the latest. Since the two-part credit terms imply a very high effective annualized interest rate, the question is why do firms use trade credit when cheaper sources of finance are available.

In their paper, "Trade Credit: Theories and Evidence" for *The Review of Financial Studies*, Peterson and Rajan (1997) focus on small firms whose access to capital markets may be limited and find evidence suggesting that firms use more trade credit when credit from financial institutions is unavailable. Using data from the 1987 National Survey of Small Business Finances, they argue that suppliers lend

---

[1]See Allen *et al.* (2003) and Yanagawa (2006).
[2]See Dun and Bradstreet (1970) and Ng, Smith and Smith (1999).

to constrained firms because they have a comparative advantage in getting information about buyers, can liquidate assets more efficiently in case of default, and that they have an implicit equity stake in the firms. In summary, Peterson and Rajan find from their analysis of small firms that suppliers may have a financing advantage, especially when the buyer is financially troubled.

In the last decade of the 20th century, informational technologies have developed rapidly. Electronic-trading systems have emerged and the cost of equity finance should be lower now than in 1987 even for small firms. Mishkin and Strahan (1999) suggest that technological change will continue to make it easier for borrowers to raise funds in financial markets. In light of these structural changes, this paper attempts to test the significance of Peterson and Rajan's (1997) results using the most recent data set from the National Survey of Small Business Finances for the United States.

The reminder of this paper is organized as follows. Section 2 provides a survey of the existing theories of trade credit and derives empirical implications. Section 3 describes the data and the empirical specification and methodology that are used in this paper. Section 4 presents the empirical findings. Section 5 concludes this paper.

2   Literature Review

Many theoretical explanations for trade credit have been proposed: For recipients, trade credit may provide access to capital for firms that are unable to raise it through more traditional channels such as bank loans. However, previous studies, including Peterson and Rajan (1994, 1997) and Wilner (2000) have point out the high costs of trade credit. High potential costs of trade credit is realized when firms do not take advantage of trade credit discounts offered. Because of the high potential costs for firms, firms will only demand trade credit if the use of it creates benefits. For some firms, trade credit may be a useful cash management tool. By delaying the payment for purchases, firms may be able to better match the timing of cash receipts from sales with the cash payments for the costs of goods sold. Ferris (1981) argues that

trade credit may reduce the transaction costs associated with cash management by allowing firms to cumulate obligations and pay them on specific dates. Emery (1987) argues that trade credit can be used to cope with variable demand efficiently. Instead of adjusting price or production, which are both costly, firms can adjust trade credit terms to control variable demand.

2.1 Quality Control Theory

Trade credit can also play a role in a firm's quality control efforts. As argued by Smith (1987) and Long, Malitz and Ravid (1993), trade credit can be a device used to manage and control the quality of the items sold by the supplier. When the quality of a product cannot be immediately verified, trade credit allows business customer to verify product quality before making the final payment. This quality concern depends on the product complexity of the items purchased by a firm and on the industry. As the complexity of the items purchased by a firm increases, the firm's demand for trade credit may increase as well. If a firm is in an industry where it must carry inventories and accounts receivables on its balance sheet, the firm may demand more trade credit.

2.2 Supply of Trade Credit

The use of trade credit will also depend on the financing options available to the firm. When firms cannot obtain a bank loan, they may be forced to use more trade credit. The question is why suppliers would offer trade credit to firms that cannot obtain a bank loan. Turning our attention to the supply side of trade credit, a possible explanation is that suppliers may be in a better position than specialized financial institutions in evaluating and controlling the credit risk of their buyers. Two theories explaining why industrial firms (suppliers) would extend trade credit when more specialized financial institutions (banks) could provide finance include the *financing advantage theory* and the *price discrimination theory*.

2.2.1 Financing Advantage Theory

In the financing advantage theory, the supplier has an advantage in investigating the credit worthiness of his clients, as well as having better ability to monitor and force repayment of the credit. These may give the supplier a cost advantage over financial institutions in offering credit to a buyer. Three main sources of cost advantage conjectured by Peterson and Rajan (1997) are: (1) advantage in information acquisition, (2) advantage in controlling the buyer, and (3) advantage in salvaging value from existing assets. Brennan, Maksimovic and Zechner (1988) and Biais, Gollier and Viala (1993) explore the advantage in information acquisition where sellers have superior information over financial institutions. Suppliers can observe a firm's purchase and payment patterns. Suppliers may also use early payment discounts on their trade credit offer, which may serve as an indirect screening device to inform the supplier of the buyer's financial health. Mian and Smith (1992) explore the advantage in salvaging value from existing assets where if the buyer defaults, the supplier can seize the goods that are supplied.[3] The more durable goods supplied the better collateral they provide and the greater the credit the supplier can provide. Because the supplier already has a network for selling its goods, its costs of repossessing and resale will be lower than that of a financial institution. Jain (2001) provides a model of trade credit in which suppliers act as a second layer of financial intermediaries between banks and borrowers as a result of their lower monitoring costs relative to banks.

2.2.2 Price Discrimination Theory

Mian and Smith (1992) also explore that trade credit may be offered even if the supplier does not have a financing advantage over financial institutions because trade credit may be used to price discriminate. Petersen and Rajan (1994) find since credit terms are usually invariant to the credit quality of the buyer[4]; trade credit reduces

---

[3]See also Frank and Maksimovic (1998).

[4]i.e. extending trade credit to everyone on the same terms and conditions following the norm in the particular industry.

the effective price to low-quality borrowers and is overpriced for the borrowers with better credit quality. Firms with a high margin between sales and variable costs for their product have a strong incentive to make additional sales but they do not want to cut prices to existing customers. These firms can engage in indirect price discrimination by using trade credit as a subsidy targeted at risky customers without breaking antitrust laws. Because the implicit interest rate involved in trade credit is high, trade credit is attractive only to high credit-risk customers. Trade credit effectively price-discriminates in favor of these buyers and also alleviates their short-term cash problem, thereby enabling them to purchase (Banerjee, Dasgupta and Kim 2004).

2.3 Other Theories of Trade Credit

Burkart and Ellingsen (2004) argue that lower monitoring cost does not fully explain the supplier's advantage over banks. They build a model in which trade credit help to overcome a potential moral hazard problem of borrowers diverting resources for private gains. This problem causes credit rationing of both bank credit and trade credit, but because inputs are harder to divert than cash and suppliers have a monitoring advantage for input use, suppliers can provide credit when banks cannot. This model explains why firms of different wealth categories face different degrees of credit rationing and have different patterns of trade credit usage. Burkart and Ellingsen's theory is empirically tested by Cunningham (2004). Using unpublished microdata files of Canadian firms, Cunningham's findings on trade credit usage provide fairly strong support for the theory's main predictions, particularly with respect to medium-wealth firms.

Fisman and Love (2004) argue that for firms in poorly developed capital markets, implicit borrowing through the use of trade credit can provide an alternative source of funds. They find that industries with higher dependence on trade credit financing exhibit higher rates of growth in countries with weaker financial institutions. Their

conclusion is that financial development is important to economic growth because with financial development, markets can more effectively allocate capital to firms with high value projects.

2.4 Empirical Studies of Trade Credit

Empirical studies have been done on the above ideas. Ng, Smith and Smith (1999) find that credit terms vary significantly across industries. They find little variation between credit terms within industries supporting the idea that a firm's industry is an important determinant of the credit terms offered to that firm. Peterson and Rajan (1997) find that the demand for trade credit is inversely related to the strength of a firm's lending relationships. Firms with longer banking relationships rely less on trade credit.

3 Data

In order to test the above theories, detailed firm-level data is needed. The data set for the 2003 National Survey of Small Business Finances (NSSBF) contains cross-sectional information on 4,240 small businesses that were in operation in the United States during December 2003 and at the time of the interview which mainly took place between June and December in 2004. This survey is regarded as the most comprehensive and detailed source of cross-sectional information on small business finance (Alphonse and Severin 2006). Virtually all missing values in the 2003 SSBF data set have been imputed. Generally, the imputations involved fitting a model to predict the missing value, and then adding a random term to the predicted value. The 2003 release contains five copies or implicates of the data set, each implicate containing survey information on the same 4,240 firms. Throughout this paper, we use imputation 1 unless otherwise specified.

In using this data set, we need to keep in mind that the sample observations are not drawn from a simple random sample and missing values on the data have been

multiply imputed. The sample design of the 2003 SSBF was a systematic stratified random design with oversampling of the larger employment size classes.[5] This should not be a problem for this paper because following Alphonse, Ducret and Severin (2006), we choose not to take into account the smallest firms, the micro-enterprises, for which very specific behavior is suspected (Berger and Udell 1998).[6] The final sample size comprises of 1,369 firms. A shortcoming of this survey is that all data are available for only one year, thus limiting the scope of the investigation.

The sample was stratified by different regions, urban/rural location, and by employment size.[7] There are 1,369 firms in the final sample, of which 1,239 are corporations (both S and C corporations) and 130 are partnerships or sole proprietorships. The median firm has a book value of $2,177,795 and sales of $5,500,000. Nearly 98% of these firms are owner managed. About 41% of the firms in our sample are in the service industry. Another 24% of the firms are in the retail trade industry.

3.1 Data Description

Here, we compute the different usage of trade credit by firms in our sample by industries. Panel A shows the full sample and Panel B excludes the micro-enterprises. Consistent with the quality control theory, firms with complex products (construction, manufacturing, & services) extend the most trade credit and firms in retail trade uses the least trade credit. In Table 1, Panel A, we see that in our sample of small businesses, accounts receivable comprise 10.7% of their sales, whereas account payable compromises 5.8% of their sales. The mean values of accounts receivable and accounts payable are similar in Panel B (10.5% and 6.4% respectively). This means

---

[5]Firms with 20 or more employees.

[6]Woodruff (2001) notes that micro-enterprises have very little access to bank loans so informal credit such as loans from family members and friends is much more common among these very small firms. As such, this will certainly impact the impact the financial structure of these firms.

[7]The regions are: New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, and Pacific. Urban is defined by whether or not the firm was located in a Metropolitan Statistical Area. Employment size is grouped into: less than 20 employees, 20-49 employees, 50-99 employees, and more than 100 & less than 500 employees.

Table 1: **Accounts payables and receivables to sales ratios**

Industry	Accounts payable/sales			Accounts receivable/sales		
	Mean	Median	% Zero	Mean	Median	% Zero
Panel A: Full sample						
Mining	2.5	0.5	41.7	8.0	8.1	41.7
Construction	5.1	2.1	36.2	11.4	5.5	30.1
Manufacturing	6.7	4.3	17.6	12.0	10.0	14.6
Transportation/utilities	7.5	1.2	35.7	7.6	5.7	27.5
Wholesale trade	6.4	3.7	22.6	10.1	7.3	17.7
Retail trade	4.3	1.2	32.5	3.5	0.2	45.3
Services	6.1	0.0	54.2	14.0	1.2	43.3
TOTAL	5.8	0.9	40.1	10.7	2.2	36.1
Panel B: Excluding micro-enterprises						
Mining	5.2	5.0	0.0	9.8	8.6	0.0
Construction	7.4	5.3	7.7	17.9	15.9	4.5
Manufacturing	7.7	5.2	2.5	14.3	12.2	2.5
Transportation/utilities	6.4	2.8	9.2	10.4	9.0	3.9
Wholesale trade	7.3	6.0	5.9	9.6	9.2	5.9
Retail trade	3.4	1.9	12.7	2.9	0.6	30.4
Services	7.2	1.3	26.9	11.4	6.7	21.8
TOTAL	6.4	2.9	13.8	10.5	7.5	15.7

This table is based on the 2003 National Survey of Small Business Finance. Firms in the finance sectors (SIC 60-69) and firms unclassified (SIC 99) were excluded. Ratios are expressed as percents. For Panel B, firms with less than 20 workers are excluded, giving a final sample size of 1369 firms.

firms in our sample, on average, extend more trade credit than they borrow. This is counter-intuitive because we expect small firms to extend less and borrow more through trade credit. Peterson and Rajan conjecture this might have result from borrower's desire to borrow through trade credit not being matched by suppliers' willingness to lend.

From Panel A, we observe that trade credit is not a net source of finance for most firms. Across the full sample, trade credit is a net source of financing for about 60% of firms. These firms use some sort of trade credit but each type of trade credit accounts for less than 14% of sales. However, in Panel B where we exclude micro-enterprises,

we see that trade credit is a net source of financing for about 84% of firms, which each type of trade credit accounts for less than 18% of sales. This significant increase in the use of trade credit in our reduced sample relative to the full sample provides evidence supporting Woodruff's (2001) idea that micro-enterprises have very little access to bank loans and trade credit and heavily rely on loans from family members and friends.

Another difference observable from Panel A and B is that the difference between the mean and the median is much smaller when we are looking at the reduced sample. This implies that in our full sample, micro-enterprises that do not have access to trade credit is skewing our data downwards. This provides us with another rationale to exclude micro-enterprises from our analysis of the determinants of trade credit. It is interesting to note that the mean for both accounts payable/sales and accounts receivable/sales in our full sample have risen monotonically from 4.4 to 5.8 and 7.3 to 10.7, respectively, relative to 1987 data.[8] However, when comparing the median in our full sample, we see that both accounts payable/sales and accounts receivable/sales have fallen from 1.8 to 0.9 and 3.8 to 2.2 respectively.

We now examine the use of trade credit by firms in our data set in more detail. Table 2, Panel A and B show the median accounts payable:sales ratio and accounts receivable:sale ratio when firms are grouped by size & industry and firm age & industry, respectively. From Panel A, we see that, in general, borrowing on and extension of trade credit increase with firm size.[9] General borrowing on trade credit seems to be constant for retail and services firms as these firms do not need to make big purchases as often as firms in manufacturing and construction. The extension of trade credit seems to increase with firms size across all industry. This is expected because larger firms have more internal cash flows and are less credit constrained, thus are more able

---

[8]Refer to Peterson and Rajan (1997) Table 1 for the values from 1987 NSSBF Data.

[9]This does not apply to mining firms. However, due the the extreme small sample size of this group, we can not conclude that our results are representative.

Table 2: **Trade credit usage by size, age, and industry**

Panel A

Firms size (# of workers)	percentile	Industry						
		mining	construction	manufacturing	transportation	wholesale	retail	services
Accounts Payable to Sales								
20-34	0-25	.09 (1)	.05 (47)	.04 (47)	.05 (12)	.04 (25)	.02 (86)	.01 (121)
34-61	25-50	.01 (1)	.04 (42)	.05 (63)	.02 (19)	.07 (26)	.02 (98)	.02 (93)
61-103	50-75	- -	.07 (33)	.06 (77)	.02 (20)	.06 (31)	.02 (74)	.01 (108)
103-486	75-100	.05 (3)	.07 (34)	.06 (91)	.03 (25)	.05 (19)	.02 (64)	.02 (109)
Accounts Receivable to Sales								
20-34	0-25	.09 (1)	.14 (47)	.11 (47)	.07 (12)	.08 (25)	.00 (86)	.02 (121)
34-61	25-50	.08 (1)	.16 (42)	.12 (63)	.09 (19)	.08 (26)	.00 (98)	.06 (93)
61-103	50-75	- -	.19 (33)	.13 (77)	.10 (20)	.09 (31)	.01 (74)	.07 (108)
103-486	75-100	.09 (3)	.16 (34)	.12 (91)	.09 (25)	.10 (19)	.01 (64)	.10 (109)

Panel B

Firms age (years)	percentile	Industry						
		mining	construction	manufacturing	transportation	wholesale	retail	services
Accounts Payable to Sales								
1-10	0-25	.08 (2)	.03 (35)	.06 (67)	.02 (15)	.04 (18)	.02 (88)	.01 (138)
10-19	25-50	- -	.07 (38)	.06 (74)	.02 (18)	.06 (31)	.02 (83)	.01 (128)
19-28	50-75	.05 (1)	.06 (40)	.05 (63)	.04 (18)	.06 (22)	.02 (68)	.01 (86)
28-68	75-100	.02 (2)	.06 (43)	.05 (74)	.03 (25)	.06 (30)	.02 (83)	.02 (79)
Accounts Receivable to Sales								
1-10	0-25	.09 (2)	.14 (35)	.12 (67)	.06 (15)	.11 (18)	.00 (88)	.05 (138)
10-19	25-50	- -	.16 (38)	.13 (74)	.12 (18)	.11 (31)	.00 (83)	.08 (128)
19-28	50-75	.15 (1)	.17 (40)	.13 (63)	.09 (18)	.07 (22)	.00 (68)	.06 (86)
28-68	75-100	.08 (2)	.16 (43)	.12 (74)	.09 (25)	.08 (30)	.01 (83)	.08 (79)

This table is based on the 2003 National Survey of Small Business Finance. This table reports the median value of accounts payable:sales ratio and accounts receivable:sales ratio. The number of firms in each cell is reported in parenthesis.

to extend trade credit to more credit constrained firms.[10] No clear relationship between a firm's age and its use of trade credit is seen from Table 2, Panel B. Rather, industrial norms seem to dictate how much trade credit is used, consistent with Ng, Smith and Smith (1999).

3.2 Estimation Strategy

Following Peterson and Rajan (1997), when we view the firm as a supplier, its accounts receivable are a proxy for how much it lends its customers. When we view the firm as a customer, its accounts payable are its borrowing from its suppliers. This paper will examine both sets of trade credit relationships a firm has. We treat the firms in our dataset first as lenders (suppliers) and then as borrowers (customers).

3.2.1 Determinants of Accounts Receivable

When regressing a firm's accounts receivable on its financial characteristics, the estimates we get are reduced form coefficients that include both supply and demand effects. If larger firms have higher accounts receivable, we can interpret the result to mean that larger firms have better access to capital markets, thus are more willing to supply credit to their customers. Alternatively, large suppliers may sell to small start-up firms with limited access to capital markets that demand the trade credit.

The estimation model for accounts receivable is as follows:

$$ARr = c + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + u \tag{1}$$

where dependent variable ARr is accounts receivable over assets, c is a constant, and u is an error term.

Explanatory variables are as follows:

- X_1: vector of variables related to the firm's own access to financing
  log(book value of assets)
  log(1 + firm age)

---

[10]Banerjee, Dasgupta and Kim (2004) found that bigger firms offer more trade credit: a proportionate increase in sales and asset size increases accounts receivable more than proportionately.

$\log(1 + \text{firm age})^2$
unused lines of credit/total assets
profits/assets
profits/assets(if positive, 0 otherwise)
profits/assets(if negative, 0 otherwise)

- X_2: vector of variables related to the firm's characteristics
  dummy = 1 if positive sales growth
  dummy = 1 if negative sales growth
  dummy = 1 if firm is located in a MSA

- X_3: vector of variables related to the firm's incentive to price discriminate
  Gross profit margin
  (Gross profit margin)^2

X_1 includes variables related to the firm's own access to financing. By including firm size and firm age (proxy for the credit worthiness of a firm), we are controlling for the availability and the cost of raising capital for the firm. The larger the firm, the more money it can borrow because it can provide more collateral. Firm age indicates how long a firm has survived. It proxies for firm quality and the firm's reputation. Older firms may know more about their customers, thus are in a better position to offer credit than financial institutions who may not have access to the same information. Another measure of credit availability to firms is the unused lines of credit over total assets for which we expect a positive impact on accounts receivable. Profits over assets proxy for internal cash generation and we expect firms with more internal cash to be more able to extend credit to their customers.

X_2 consists of dummy variables related to the firm's characteristics. A firm experiencing positive sales growth may extend less trade credit because it is more likely that it will want to keep its cash for reinvestment and expansion purposes. A firm experiencing negative sales growth may extend more trade credit in attempt to maintain its sales. Institutional lending is less available in the more competitive Metropolitan Statistical Area (MSA), thus we should expect firms in a MSA to extend more trade credit due to higher demand in the area.

Variables on X_3 allow us to test the price discrimination theory of trade credit. It predicts that trade credit should be positively related to a firm's gross profit margin.

The larger a firm's gross profit margin, the more room the firm has to engage in favorable indirect price discrimination toward marginal customers facing short-term cash problems (Banerjee et al. 2004).

3.2.2 Determinants of Accounts Payable

When estimating a firm's level of accounts payable, the estimates are determined simultaneously by both the credit extended to the firm by its suppliers as well as the firm's demand for funds. We use the fraction of the firm's annual purchase that is made on account as a proxy for the quantity of credit supplied to the firm. We do this because, since there is no cost to accepting credit at least until the discount date[11], the fraction annually purchased on account is relatively close to the fraction that is offered on account (which is voluntarily offered by suppliers). Again, following Peterson and Rajan (1997), the estimation of the amount borrowed from suppliers proceeds in two steps. First, we estimate the fraction of goods offered on credit to the firm based on its characteristics. Then, using these estimates, we predict the firm's demand for trade credit.

The estimation model for credit purchase is as follows:

$$cpr = c + \alpha_1 X_1 + \alpha_2 X_2 + u \qquad (2)$$

where dependent variable cpr[12] is purchases made on credit over assets, c is a constant, and u is an error term.

Explanatory variables are as follows:

---

[11]Credit terms typically quote a discount date by which the customer receives a discount if their bill is paid within the discount date. The customer gets what is effectively an interest-free loan until the discount date.

[12]For reasons given above, a firm's purchases on account should be a good measure of the credit offered to the firm. Since we do not know what fraction of a firm's cost of goods sold are purchases, we estimate the firm's credit purchases as the fraction of purchases made on credit multiplied by the firm's of cost of good sold. Peterson and Rajan (1997) has point out that this variable is mismeasured because in additional to purchases, the cost of goods sold includes wages and other items. Therefore, we subtract salaries, wages and officers compensation from the cost of goods sold before estimating the firm's credit purchases.

- X_1: vector of variables related to firm credit quality
  log(book value of assets)
  profits/assets
  log(1 + firm age)
  log(1 + firm age)^2
  dummy = 1 if firm is incorporated

- X_2: vector of variables related to relationships with lenders
  log(1 + duration of the longest relationship with lender)
  dummy = 1 if firm denied request for loan recently
  profits/assets(if profits > 0)
  profits/assets(if profits < 0 & sales growth > 0)
  profits/assets(if profits < 0 & sales growth < 0)

X_1 was adopted because the firm's credit quality may be especially important in determining whether it is offered credit. Since firms in an industry get standard trade credit terms[13], we expect suppliers to use quantity instead of price to discriminate between buyers. Because so, firms with higher credit quality should receive more trade credit. We measure a firm's credit quality by the size of a firm in terms of the book value of its total assets. The longer the firm has been in business, the longer it has survived, thus the higher its credit quality. We include the square of this variable to allow for the possibility of a non-monotonic relationship. Incorporated firms should, on average, have higher credit quality because they are more transparent than their non-incorporated counter-parts.

Variables on X_2 allow us to test the financing advantage theory, primarily on whether or not suppliers have better information on their customers than financial institutions. If suppliers rely on banks for financial information concerning buyers, then we would expect a positive relationship between a firm's longest length of relationship with a financial institution and the amount of trade credit offered. If a firm is denied request for loan recently, we would expect this firm to demand more trade credit. If the coefficient on this variable is negative, we have evidence that suppliers rely on banks to monitor on their behalf. However if the coefficient is positive, we have evidence for Burkart and Ellingsen's theory that suppliers can provide credit

---

[13]See Smith 1987.

when banks cannot.

Lastly, we test to what kind of firms do suppliers offer more trade credit to by separating firms into three profit categories: positive, negative with positive sales growth, and negative with negative sales growth. Suppliers can infer rather or not their customers are experiencing positive or negative sales growth by observing their demand for supplies. Financing advantage theory suggests that since suppliers have an advantage in salvaging value from existing assets when the buyer defaults, it is plausible for suppliers to extend trade credit to buyers who are experiencing financing difficulties (negative profits and negative sales). Suppliers have an incentive to invest in firms with positive growth as potential gains can be realized in the long-run. Therefore, we expect the coefficient on positive profits to be positive and the coefficients on negative profits for both positive and negative sales growth to be negative.

The estimation model for trade credit demand is as follows:

$$APr = c + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + u \tag{3}$$

where dependent variable APr is accounts payable over assets, c is a constant, and u is an error term.

Explanatory variables are as follows:

- X_1: predicted supply of trade credit/assets ($\hat{cpr}$)

- X_2: vector of variables related to demand for capital
  dummy $= 1$ if positive sales growth
  dummy $= 1$ if negative sales growth
  log(book value of assets)
  log($1 +$ firm age)
  log($1 +$ firm age)^2
  current assets/total assets
  dummy $= 1$ if firm applied for loan recently

- X_3: vector of variables related to credit availability
  profits/assets
  unused line of credit/total assets
  log($1 +$ duration of the longest relationship with lender)
  dummy $= 1$ if firm denied request for loan recently
  dummy $= 1$ if firm is located in a MSA

As explained earlier, a firm's level of accounts payable is determined by both the credit extended to the firm by its suppliers as well as the firm's own demand for funds. In attempt to separate these two effects, we include the predicted value of the supply of trade credit to the firm ($\hat{cpr}$) in our estimation of the determinants of accounts payable. By controlling for credit extended by the firm's suppliers, the remaining variation in accounts payable should be determined by a firm's demand for credit in general and its demand for trade credit in particular.

Variables on X_2 proxy for the firm's credit demand. We measure a firm's investment opportunities by whether or not it is experiencing positive or negative sales growth. We expect firms with positive sales growth to demand more trade credit as they have more investment opportunities to expand their businesses. The trade credit demand of firms with negative sales growth is non-trivial. While negative sales growth may imply their market maturing, thus less investment opportunities and less demand for credit; it also can imply a negative shock to firms and these firms may demand more short-term credit from being credit constrained during this period. The sign of the effect is best left to the regression analysis.

It is well established in the finance literature that the source of finance evolves with the growth of the firm (Berger and Udell 1998). Therefore, a firm's use of trade credit should be related to its age. We measure this by taking the log of one plus the firm's age. To account for the possibility of non-linearity and opposite behaviors at different firm ages, we also include the square of this variable. The size of a firm's total assets also measures a firm's investment opportunities. In a sample of large firms, investment opportunities typically decline in firm size and age. For small firms in our sample, this is less clear, as certain projects may become viable only after the firm has acquire a certain level of assets and experience. We include current assets over total assets to measure a firm's demand for short-term financing because it is unlikely that a firm will finance short-term projects with long-term loans. We expect the coefficient on this variable to be positive. A crude proxy for whether firms need

credit is a dummy variable for whether or not the firm has applied for loan recently. We expect this variable to be positively related to accounts payable as it represents the firm's need for credit in general.

X_3 are variables representing the a firm's liquidity position and the availability of credit from financial institutions. Trade credit borrowing comes lower down the financial pecking order than retained earnings which are effectively costless.[14] Therefore, a firm's ability to generate cash internally, measured by profits scaled by total assets, should decrease the firm's demand for trade credit. The more unused lines of credit a firm have, the more credit is available to the firm. Again, because trade credit is an expensive form of external financing, we expect a negative impact on trade credit use. Peterson and Rajan (1994) find that relationships between firms and financial institutions relax credit rationing. Because so, the stronger a firm's relationship with financial institutions, measured by the duration of the longest relationship with lender, the less trade credit should be demanded if trade credit is used as a substitute for loans. Finally, if a firm has been denied its request for loan recently and if a firm is located in a more competitive market, we expect the firm to demand more trade credit as it can not obtain the cheaper institutional financing.

4   Empirical Results

A summary of the data is reported in Table 3.

4.1   Determinants of Accounts Receivable

In Table 4, we report the results of Regression 1.

As we expect, larger firms offer more trade credit. A firm with \$6,063,050 (the 75th percentile) extends an additional 1.2% more of its assets in the form of accounts receivable as compared to a firm with \$713,325 in assets (the 25th percentile). However, this effect is not economically large for the median accounts receivable to assets

---

[14]The high cost of trade credit was discussed in section 1.

Table 3: **Summary statistics**

Variables	Median	Mean	Standard deviation
Accounts receivable / Total assets (%)	17.6	24.6	24.9
Accounts payable / Total assets (%)	8.0	15.9	32.9
Net profits / Total assets (%)	8.9	49.5	382.5
Unused lines of credit / Total assets (%)	12.1	27.5	82.7
Credit purchase / Total assets (%)	133.4	218.6	434.3
Current assets / Total assets (%)	48.2	46.9	29.7
Gross profit margin (%)	6.2	14.1	18.7
Total assets (1 000 USD)	2 178	5 817	14 000
Firm age (years)	19	21	14
Longest relationship with lender (years)	14	17	13

	Percent	
Dummy variables	0	1
Positive sales growth	48.8	51.2
Negative sales growth	78.1	21.9
Firms in MSA	21.7	78.3
Firm is incorporated	9.5	90.5
Firm applied for loan recently	30.2	69.8
Firm denied request for loan recently	95.7	4.3

ratio is 17.6% (see Table 3).

In Table 4, Column 1, older firms extend less credit to their customers even though this effect is not statistically significant. Increasing firm age from 0 to 19 (the minimum to the median) lowers the firm's accounts receivables by 2.4% of assets. Allowing for non-linearity in the relationship, we include the square of the log of firm age (see Table 4, Column 2). We find that the coefficient on firm age becomes positive while its square is negative. This suggests that accounts receivable first increase with age and eventually fall. Accounts receivable peak when firm is about 10 years of age. The initial increase of accounts receivable to assets when a firm matures from a startup to a 10-year-old firm is much more dramatic than the decline after the peak. Additional years early in its life add significantly to a firm's reputation and the amount of information it has on its customers, but have little effect later on.

Table 4: **The determinants of accounts receivable over assets**

Independent variable	(1)	(2)	(3)	(4)$^{\alpha}$
Access to financing				
Log(book value of assets)	.006	.008	.008*	.002
	(.005)	(.005)	(.005)	(.005)
log(1 + firm age)	-.008	.071	.073	.055
	(.009)	(.050)	(.050)	(.045)
log(1 + firm age)^2		-.015	-.016*	-.012
		(.010)	(.010)	(.009)
Unused lines of credit/assets	-.037***	-.035***	-.034***	-.015***
	(.006)	(.006)	(.006)	(.006)
Net profits/assets	-.006	.003		
	(.005)	(.005)		
Net profits/assets			.003	.000
if positive, zero otherwise			(.003)	(.002)
Net profits/assets			.000	.001
if negative, zero otherwise			(.002)	(.002)
Firm characteristics				
Positive sales growth (0,1)	-.002	-.001	-.002	.002
	(.016)	(.016)	(.016)	(.014)
Negative sales growth (0,1)	.002	-.002	-.001	.003
	(.019)	(.019)	(.019)	(.017)
Firms in MSA (0,1)	.096***	.094***	.094***	.052***
	(.016)	(.016)	(.016)	(.015)
Price discrimination				
Gross profit margin	-.045**	-.481***	-.482***	-.435***
	(.019)	(.119)	(.110)	(.101)
(Gross profit margin)^2		.505***	.504***	.480***
		(.135)	(.124)	(.114)
Number of observations	1369	1369	1368	1368
R^2	.068	.080	.080	.316

The dependent variable is the accounts receivable to assets ratio. The coefficients are estimated using ordinary least squares. Standard errors are in parentheses. Each regression has a constant which is not reported. Firms in the financial industry (SIC 60-69) and unclassified (SIC 99) are excluded unless otherwise stated. When the distribution of a variable was highly skewed for high values, we recoded the highest percent of values to the 99th percentile of the distribution. Similarly if it was highly skewed for low values, we recoded the lowest percent of values to the 1st percentile of the distribution.
$^{\alpha}$53 two-digit SIC indicators are included in addition to the constant.
***p< 0.01, **p< 0.05, *p< 0.10

Contrary to our prediction, there is a significant negative relationship between the trade credit a firm extends and the relative amount of unused lines of credit. The less unused lines of credit a firm has, the more trade credit it extends. This suggests that trade credit is at least partially financed by loans. This conjecture is confirmed by the fact that relative net profits, an indicator of a firm's internal cash generation capability, is negatively related to trade credit extended (though this relationship is not statistically significant).

Peterson and Rajan (1997) found that firms with positive sales growth offer slightly more receivables and firms that have seen their sales decline offer significantly more trade credit. In our data, we do not find a statistically significant nor a consistent relationship between sales growth and trade credit extended.[15] As we predict, firms in a MSA offer significantly more trade credit relative to firms in a non-MSA. Since institutional lending is more competitive in metropolitan areas, trade credit may play a larger role in these areas.

To our surprise, gross profit margin has a significant negative impact on trade credit extended. This is contrary to what the price discrimination theory predicts. However, this may not be the correct specification. Allowing for a non-monotonic relationship, we include the square of gross profit margin in Table 4, Column 2. With this specification, we find that there is a statistically significant non-linear relationship between gross profit margin and trade credit extended. Trade credit extended first decreases with gross profit margin and eventually rises. For firms in our data set, this implies that accounts receivable decrease with gross profit margins until they reach about 48% before increasing. Putting these numbers in perspective, on average, firms in our sample tend to extend less trade credit as their gross profit margin increase.[16]

---

[15]The explanatory power of our variable for positive or negative sales growth is much lower than the ones used by Peterson and Rajan (1997). This is because firms no longer report the exact percentage change in their sales in the 2003 NSSBF. Instead, they answer a question on whether or not their sales have increased, decreased, or stayed the same relative to the previous year. Due to this limitation, we were only able to construct dummy variables for sales growth, and unfortunately, they do not carry much explanatory power. This may also explain the low R-squared values of our regressions relative to those of Peterson and Rajan (1997).

[16]The mean and median gross profit margin are 14.1% and 6.2% respectively.

The lower its profit margin, the more trade credit a firm extends.

In Table 4, Column 3, following Peterson and Rajan (1997), we separate net profits into two components. We do not find evidence to support Peterson and Rajan's finding that profits are negatively correlated with receivables. Because part of the pattern of trade credit can be explained by differences across industries, we control for these sectors specific effects by including detailed industry dummies. 53 two-digit SIC indicators are included in Table 4, Column 4. The explanatory power of this regression is much higher than previous ones that do not include the industry dummies, reconfirming the claim that the industry a firm is in has a huge impact on determining its use of trade credit. The qualitative results from previous regressions remain unchanged.

4.2 Determinants of Accounts Payable

We now turn to who receives credit from their suppliers and for how long. Note that a firm's accounts payable will depend on both the amount of credit its suppliers offer and its own demand for trade credit. As mentioned earlier, we first estimate the fraction of goods offered on credit to the firm based on its characteristics. Then, using these estimates, we predict the demand of trade credit by the firm.

In Table 5, we report the results of Regression 2.

Contrary to our expectation, the size of a firm measured by the size of its assets has a significant negative impact on the amount of trade credit offered (see Table 5, Column 1). The more assets a firm has, the less trade credit it is offered. Putting it another way, firms with less assets (younger firms) seem to be offered more trade credit. We can examine this further by looking at the firm's age and its square. Although statistically insignificant, we see that trade credit offered first increases with firm age and eventually declines when firms reach the age of 14. This could be related to the firm's growth cycle where younger firms have higher financing needs and are more indebted. Net profits have a significant positive impact on the amount

Table 5: **Trade credit supply: Purchases made on credit over assets**

Independent variable	(1)	(2)$^{\alpha}$	(3)	(4)
Firm credit quality				
Log(book value of assets)	-.805***	-.760***	-.814***	-.779***
	(.102)	(.117)	(.102)	(.103)
Net profit/assets	.303***	.216*	.300***	
	(.112)	(.113)	(.112)	
Log(1 + firm age)	1.677	1.411	1.633	1.610
	(1.157)	(1.153)	(1.158)	(1.151)
Log(1 + firm age)^2	-.309	-.265	-.301	.217
	(.218)	(.218)	(.218)	(.177)
Firm is incorporated	-.045	.240	-.041	-.059
	(.516)	(.524)	(.516)	(.513)
Relationships with lenders				
Log(1 + Longest relationship	.085	.196	.080	.143
with lender in years)	(.252)	(.255)	(.252)	(.251)
Firm denied request for loan			-.711	
recently (0,1)			(.739)	
Net profit/assets				.167***
(if profits > 0)				(.057)
Net profit/assets				-6.156**
(if profits < 0 & sales growth > 0)				(2.375)
Net profit/assets				-5.813*
(if profits < 0 & sales growth < 0)				(2.999)
Observations	1369	1369	1369	1369
R^2	.065	.151	.066	.066

The dependent variable is the firm's purchase on account to assets ratio. Purchase on account is calculated as the percent of purchases made on account times the costs of goods sold minus wages. The coefficients are estimated using ordinary least squares. Standard errors are in parentheses. Each regression has a constant which is not reported. Firms in the financial industry (SIC 60-69) and unclassified (SIC 99) are excluded unless otherwise stated. When the distribution of a variable was highly skewed for high values, we recoded the highest percent of values to the 99th percentile of the distribution. Similarly if it was highly skewed for low values, we recoded the lowest percent of values to the 1st percentile of the distribution.
$^{\alpha}$53 two-digit SIC indicators are included in addition to the constant.
***p< 0.01, **p< 0.05, *p< 0.10

of trade credit offered. The more profits a firm makes, the more internal cash it generates and the higher its credit quality. Incorporated firms are not offered more trade credit and this effect is not statistically significant.[17] Overall, firms with a high

---

[17]There may be a sample bias here as we have 1,230 incorporated firms and only 130 non-

profits to assets ratio that have a low level of assets seem to be offered the most trade credit. This result survives the inclusion of 53 two-digit SIC indicators in Table 5, Column 2.

If suppliers rely on banks for financial information concerning their buyers, we would expect there to be a positive relationship between a firm's longest length of relationship with a financial institution and the amount of trade credit offered. The coefficient on a firm's longest length of relationship with a financial institution is indeed positive in our data but it is not statistically significant. That is, we do not have strong evidence to disprove the financing advantage theory where suppliers have better information on buyers than financial institutions. In Table 5, Column 3, we include information on whether the firm has been denied request for loan recently. The coefficient on this variable is not statistically significant. Taken together, the above results seem to rule out the possibility of suppliers relying on banks for information on their customers.

Since, suppliers can infer on their customer's sales growth by directly observing the demand for supplies, we separate profits into three different categories to see to what firms suppliers offer more trade credit (see Table 5, Column 4). Firms experiencing positive profits are offered more trade credit. Interestingly, firms who are currently losing money get more credit the lower their profits. This effect is greater for firms that are experiencing positive sales growth. These results provide evidence supporting the financing advantage theory in which suppliers has an implicit equity stake in their buyers and an advantage in salvaging value from existing assets when buyers default, thus making it plausible for suppliers to extend trade credit to buyers who are experiencing financing difficulties.

Having examined the supply of trade credit, we now turn to the determinants of a firm's demand for trade credit. We explain the firm's stock of accounts payable using

incorporated firms in our final sample. Note that we have eliminated firms with less than 20 workers. Thus, the 130 non-incorporated firms in our sample may be from a higher quality group than the average non-incorporated firms.

proxies for the firm's demand for credit conditional on the predicted supply of trade credit.

In Table 6, we report the results of Regression 3.

A firm's stock of accounts payable significantly decreases in our estimate of the purchases that are supplied on account to the firm. In another words, firms that face less purchases supplied on account have a higher demand for trade credit. This leads back to the discussion on the mismatch of borrower's desire to borrow and supplier's willingness to lend discussed on page 8.

Conditional on the credit extended by the firm's suppliers, the remaining variations in accounts payable should be determined by the firm's demand for credit. Our data shows that sales growth (both positive and negative) does not have a significant effect on a firm's stock of accounts payable. Having said that, firms facing negative sales growth seem to demand more trade credit relative to ones facing positive sales growth.[18] This provides some evidence that firms demand more trade credit because they are credit constrained. The smaller a firm is, in terms of assets, the more investment opportunities it has and the more trade credit it demands. This impact is statistically significant.

As finance literature suggests, the demand for trade credit as a source of finance does evolve with the growth of a firm. Trade credit demand first increases with firm age and eventually declines when firms reach the age of 14. Trade credit demand may decrease in firm age for various reasons. Older firms may have accumulated enough internal cash so that they do not need to use more expensive sources of financing such as trade credit. Older firms may also demand less trade credit because of the decline in their investment opportunities. Just as we expect, current assets to total assets ratio have a significant positive effect on trade credit demand. This implies current assets are indeed financed by short-term financing including the use of trade credit. Whether or not firms have applied for loan recently do not seem to have a significant

---

[18]See Table 6, Column 3.

Table 6: **Trade credit demand: Accounts payable over assets**

Independent variable	(1)	$(2)^\beta$	$(3)^\gamma$	(4)
Predicted supply of trade	-.218***	-.448	-.295***	-.218***
credit/assets$^\alpha$	(.082)	(.471)	(.082)	(.082)
Demand for capital				
Positive sales growth (0,1)	.010	.013	.020	.010
	(.018)	(.019)	(.017)	(.018)
Negative sales growth (0,1)	.030	.031	.035*	.030
	(.021)	(.021)	(.021)	(.021)
Log(book value of assets)	-.202***	-.386	-.265***	-.202***
	(.066)	(.376)	(.065)	(.066)
Log(1 + firm age)	.353**	.724	.472***	.353**
	(.144)	(.763)	(.144)	(.144)
Log(1 + firm age)^2	-.064**	-.132	-.086***	-.064***
	(.027)	(.140)	(.027)	(.027)
Current assets / total assets	.264***	.262***	.295***	.264***
	(.026)	(.026)	(.029)	(.026)
Firm applied for loan	-.012	-.008	-.018	-.012
recently (0,1)	(.017)	(.016)	(.017)	(.019)
Credit availability				
Net profits/assets	.063***	0.124	.082***	.063***
	(.023)	(.125)	(.022)	(.023)
Unused lines of credit/assets				.001
				(.008)
Firm denied request for loan	.109***	.106***	.082***	.109***
recently (0,1)	(.036)	(.036)	(.036)	(.037)
Log(1 + Longest relationship	.007	.026	.008	.007
with lender in years)	(.014)	(.040)	(.036)	(.014)
Firms in MSA (0,1)	-.005	-.005	-.002	-.005
	(.018)	(.018)	(.014)	(.018)
Observations	1361	1361	1361	1361
R^2	0.097	0.091	0.181	0.097

The dependent variable is the firm's accounts payable to assets ratio. The coefficients are estimated using ordinary least squares. Standard errors are in parentheses. Each regression has a constant which is not reported. Firms in the financial industry (SIC 60-69) and unclassified (SIC 99) are excluded unless otherwise stated. When the distribution of a variable was highly skewed for high values, we recoded the highest percent of values to the 99th percentile of the distribution. Similarly if it was highly skewed for low values, we recoded the lowest percent of values to the 1st percentile of the distribution.

$^\alpha$Predicted trade credit supply is the estimated value of purchase on account over assets from Table 5, Column 1.

$^\beta$This regression was estimated using instrumental variables. In addition to the other variables in the regression, we used whether the firm was incorporated as instruments.

$^\gamma$53 two-digit SIC indicators are included in addition to the constant.

***p< 0.01, **p< 0.05, *p< 0.10

impact on the demand of trade credit.

Turning to the credit availability and its impact on trade credit demand, we see that higher profits have a significant positive impact on trade credit demand. This is contrary to our prediction that, since trade credit comes lower down the financial pecking order than internal funds, higher profits should be associated with lower levels of accounts payable. A possible explanation for this result is that profits proxy for a firm's investment opportunities. The more profitable a firm is, the more investment opportunities and growth it is facing. As a result, firms may demand more trade credit despite the high implicit costs so that more positive NPV projects can be undertaken. The amount of unused lines of credit does not play a significant role in determining trade credit demand (Table 6, Column 4). Firms denied request for loan recently have a significant positive impact on trade credit demand. This supports the idea that trade credit is used as a substitute to loans. Finally, a firm's longest relationship with lender and whether or not a firm is located in a MSA do not play a significant role in determining trade credit use.

The above results remain unchanged qualitatively when we use instrumental variables for the supply of trade credit (Table 6, Column 2) and when we include 53 two-digit SIC industrial indicators into our regression (Table 6, Column 3).

5 Conclusion

We now attempt to gather the evidence concerning the use of trade credit by firms we have obtained in this paper.

One question we attempt to answer is why do firms use trade credit when cheaper sources of finance are available. Our data shows that trade credit is primarily used by two categories of firms: ones making high profits and ones making losses.

The rationale for the former to use trade credit, despite its high implicit costs, is that these firms have more growth opportunities. They may have used up other sources of funds such as internal financing, using retained earnings, and external fi-

nancing, from loans obtained from financial institutions. As a result, these firms use trade credit even though it is lower in the financial pecking order. Our hypothesis of the cost of equity financing decreasing due to recent rapid developments in informational technologies does not seem to have altered trade credit usage patterns much. If it is easy for firms to raise funds in financial markets and equity and trade credit are substitutes, then it is not rational for these firms making higher than average profits to use trade credit which is an expensive form of financing.

The latter are firms having low credit qualities and have been recently denied request for loans. They use trade credit as a source of financing of last resort. Even so, evidence suggests that these firms in need of trade credit are subject to credit rationing, as firms facing less purchases supplied on account are the ones who demand more trade credit. This is consistent with findings of Cunningham (2004) that low-wealth firms using trade credit are constrained in both bank credit and trade credit markets.

Distressed firms that are currently losing money but have positive sales growth are offered more trade credit than ones losing money and have negative sales growth. Either case, these distressed firms are still offered credit because suppliers can discriminate between good and bad firms in troubled periods and thus be able to provide financial support better than banks do (Wilner 2000).

For both of the above categories of firms, we find trade credit use is more prevalent for younger firms that have been in operation for less than 14 years and for firms operating in a MSA where institutional lending is more competitive. This leads us to the disavailability argument where firms use trade credit because other sources of funds are not available. Our data suggests high credit quality firms use part of the loans they obtained from financial institutions to extend trade credit to their buyers. These buyers, in turn, use trade credit to finance their current assets. This supports previous findings by Demirguc-Kunt and Maksimovic (2001) and Jain (2001) that suggest suppliers do act as financial intermediaries between banks and borrowers.

Higher credit quality firms channel part of their funds from financial institutions to lower quality firms who may not have direct access to institutional borrowing.

Understanding the determinants of trade credit has important policy implications. Traditionally, small and medium enterprise (SME) financing programs generally focus on helping local financial intermediaries to provide financing to SMEs through directed credit programs. These programs have not been all that successful in the past. The implication of this paper is that higher credit quality firms have a role to play in intermediating funds to lower credit quality firms. Understanding the determinants of trade credit will enhance our ability to formulate effective financing program towards SMEs that are in need.

References

Allen, Franklin, Jun Quan, and Meijun Quan (2003) 'Law, Finance, and Economic Growth in China.' ILE, University of Pennsylvania Law School, Research Paper 3-21

Alphonse, Pascal, Jacqueline Ducret, and Eric Severin (2006) 'When trade credit facilitates access to bank finance: Evidence from US small business data.' *mimeo.* University of Lille 2

Banerjee, Shantanu, Sudipto Dasgupta, and Yungsan Kim (2004) 'Buyer-Supplier Relationships and Trade Credit.' HKUST Working Paper

Berger, Allen N., and Gregory F. Udell (1998) 'The economics of small business finance: The role of private equity and debt markets in the financial growth cycle.' *Journal of Banking and Finance* 22, 613–673

Biais, Bruno, Christian Gollier, and Pascale Viala (1993) 'Why Do Firms Use Trade Credit?' *mimeo.* CEPR Conference in San Sebastian, Spain

Brennan, Michael J., Vojislav Miksimovic, and Josef Zechner (1988) 'Vendor Financing.' *The Journal of Finance* 43(5), 1127–1141

Burkart, Mike, and Tore Ellingsen (2004) 'In-Kind Finance: A Theory of Trade Credit.' *The American Economic Review* 94(3), 569–590

Choi, Woon Gyu, and Yungsan Kim (2003) 'Trade Credit and the Effect of Macro-Financial Shocks: Evidence from U.S. Panel Data.' IMF Working Paper NO.03/127

Cunningham, Rose (2004) 'Trade Credit and Credit Rationing in Canadian Firms.' Bank of Canada Working Paper 2004-49

Demirguc-Kunt, Asli, Vojislav Maksimovic (2001) 'Firms as Financial Intermediaries: Evidence from Trade Credit Data.' World Bank Working Paper

Diamond, Douglas W. (1989) 'Reputation Acquisition in Debt Markets.' *Journal of Political Economy* 97, 828–861

Dun and Bradstreet (1970) *Handbook of Credit Terms* (New York: Dun and Bradstreet)

Emery, Gary W. (1987) 'An Optimal Financial Response to Variable Demand.' *The Journal of Financial and Quantitative Analysis* 22(2), 209–225

Ferris, J. Stephen (1981) 'A Transactions Theory of Trade Credit Use.' *The Quarterly Journal of Economics* 96(2), 243–270

Fisman, Raymond, and Inessa Love (2004) 'Financial Development and Intersectoral Allocation: A New Approach.' *The Journal of Finance* 59(6), 2785–2807

Frank, Murray, and Vojislav Maksimovic (1998) 'Trade Credit, Collateral, and Adverse Selection.' *mimeo.* University of British Columbia

Jain, Neelam (2001) 'Monitoring costs and trade credit.' *The Quarterly Review of Economics and Finance* 41(1), 89–110

Long, Michael S., Ileen B. Malitz, and S. Abraham Ravid (1993) 'Trade Credit, Quality Guarantees, and Product Marketability.' *Financial Management* 22(4), 117–127

Mian, Shehzad L., and Jr. Smith, Clifford W. (1992) 'Accounts Receivable Management Policy: Theory and Evidence.' *The Journal of Finance* 47(1), 169–200

Mishkin, Fredric S., and Philip E. Strahan (1999) 'What Will Technology Do to Financial Structure?' NBER Working Papers 6892, National Bureau of Economic Research, Inc, January

Ng, Chee K., Janet Kiholm Smith, and Richard L. Smith (1999) 'Evidence on the Determinants of Credit Terms Used in Interfirm Trade.' *Journal of Finance* 54(3), 1109–1129

Nilsen, Jeffrey (2002) 'Trade Credit and the Bank Lending Channel.' *Journal of Money, Credit, and Banking* 34, 226–253

Peterson, Michell A., and Raghuram G. Rajan (1997) 'Trade Credit: Theories and Evidence.' *The Review of Financial Studies* 10(3), 661–691

Peterson, Mitchell A., and Raghuram G. Rajan (1994) 'The Benefits of Lending Relationships: Evidence from Small Business Data.' *The Journal of Finance* 49(1), 3–37

Smith, Janet Kiholm (1987) 'Trade Credit and Informational Asymmetry.' *The Journal of Finance* 42(4), 863–872

Wilner, Benjamin S. (2000) 'The Exploitation of Relationships in Financial Distress: The Case of Trade Credit.' *Journal of Finance* 55(1), 153–178

Woodruff, Christopher (2001) 'Firm Finance from the Bottom Up: Microenterprises in Mexico.' Working Paper No. 112, Standford Center for International Development

Yanagawa, Nariyuki (2006) 'Trade Credit adn Imperfect Enforcement.' In *Recovering Financial Systems: China and Asian Transition Economies,* ed. Mariko Watanabe (Palgrave Macmillan) chapter 5, pp. 85–96