Credit Rationing in Informal Markets: The Case of Small Firms in India

Sankar De*and Manpreet Singh*

Present version: September 2010

Abstract

Using a unique dataset combining survey responses with panel data of reported financial activities of a sample of small and medium enterprises in India, the present study examines availability of different types of relationship-based credit, including credit driven by business relationships and social relationships. We find evidence of rationing for each type of credit. A high interest rate necessary to clear the market for loans creates a "debt overhang" for the smaller borrowing firms who capture a relatively small part of the returns given their large debt repayment obligations. To limit moral hazard on the part of the borrowers in this situation, credit providers decline to extend credit beyond a certain point regardless of the credit terms. Even if relationships mitigate information asymmetry problems, moral hazard concerns still constrain credit supply. This is the first study to document rationing of informal credit. Our findings have important research and policy implications.

Keywords: informal relationships, markets, legal institutions, trade credit, credit rationing
JEL Classifications: G0, K0, O5

* The authors are at the Centre for Analytical Finance (CAF), Indian School of Business (ISB), Hyderabad 500032, INDIA. Sankar De (corresponding author) can be reached at Sankar_De@isb.edu.
The authors gratefully acknowledge funding support from Citigroup Foundation. They thank P. Bhimasankaram, Sudipto Dasgupta, Todd Gormley, Ravi Jagannathan, NR Prabhala, Subrata Sarkar, Krishnamurthy Subramanian and Sheridan Titman for helpful comments and suggestions. They also thank the participants in the CAF Summer Research Conference 2008 and Financial Intermediation Research Society Conference 2009 for their comments. The authors remain responsible for all errors in the paper.

I. Introduction and motivation

Using a unique dataset combining survey responses with panel data of financial activities obtained from the reported financial statements of a sample of small and medium enterprises (SMEs) in India, our study examines trade credit transactions between the firms in our sample. We find that a significant proportion of the transactions are based on informal contracts driven by relationships between the parties concerned[1]. However, we also find evidence of rationing of relationship−based credit. Credit providers appear to be reluctant to offer credit beyond a point regardless of the credit terms. Credit driven by business as well as social relationships between the lenders and borrowers is subject to rationing. We find that rationing is correlated with firm size; the smaller firms in our sample appear more likely to be credit-rationed.

We investigate possible motives for credit rationing by credit providers. Our scenario of relationship-based credit is not consistent with Stiglitz and Weiss (1981) model of credit rationing which rests on adverse selection (the creditors' inability to distinguish between borrowers of different degrees of risk). It is, however, consistent with a moral hazard model of credit rationing (Ghosh *et al*, 1999). The creditors resort to rationing to prevent *involuntary* default by borrowers. When direct monitoring by the lenders over the use of credit is not feasible, a high interest rate necessary to clear the market for loans creates a "debt overhang" problem for the borrowing firms. Since they capture a relatively small part of the returns given their large debt repayment obligations, the debt overhang reduces their incentive to avoid low-return states and possible default. Limited liability of the borrowing firms results in the lenders bearing all the downside risk and accentuates the adverse incentive problem. The problem is more serious for the smaller firms.[2] To limit default in this scenario, the lenders do not allow interest rate to rise to a level where existing demand for credit is fully satisfied, and resort to rationing when the rate reaches a critically high level.

To arrive at our findings, we conduct a variety of tests under alternative specifications. All test results confirm rationing. The results identify the costs of credit that are high enough to

[1] Throughout this paper, we use the two terms "relationship−based" and "informal" interchangeably. In our context, the usage is justified. Our enquiries reveal that the relationship−based contracts in our sample are informal also, in that no legally binding contracts were used. In many cases, the contracts were verbal.

[2] As long as the borrowing firms do not have enough assets to guarantee the full value of the loans, it can be shown under fairly general conditions that their effort choice will be less than first-best (see Proposition 1 in Ghosh *et al*, 1999).

trigger rationing of different types of relationship-based credit, including credit driven by business and social relationships, and the pools of borrowers who are subjected to rationing. The critical costs are usually in 50% – 58% range depending on the credit type. We verify that the credit received by the firms in our sample actually decline at higher rates, as the model predicts.

Our tests results consistently indicate that the bottom 20% – 30% of the firms in our sample by asset size are at risk of credit rationing. Observed differences in characteristics between this group of firms and other firms in our sample provide support for the moral hazard model of rationing of informal credit. The former firms are much smaller by asset size, but have more bank credit and total credit in relation to their asset base than the other firms, lending credence to our hypothesis about debt overhang. They generate less funds internally through their operations, take much longer to pay off their trade credit dues and grow at a significantly slower rate. They also receive less trade credit, relationship-based and otherwise, than the other firms in absolute terms as well as adjusted for firm size. We do not find support for an alternative hypothesis whereby the lenders ration informal credit to prevent *voluntary* default by borrowers who have substantial outside options. For such borrowers, the standard repeated-game incentives of relational contracting are weak, resulting in contract failure[3]. If this were true for our sample of firms, then we would observe the larger and more profitable firms to be credit-rationed, because they are more likely to have more outside options.

However, relationships are not entirely without value in inter-firm credit markets. Our test results concerning two important alternative financing sources - internal sources of funds and bank credit – consistently indicate that the firms that are unsuccessful in raising funds internally as well as from banks appear to have better access to relationship-based credit. A plausible explanation for the results is that the credit suppliers use the credit to invest in special relationships with the firms that are cut off from other sources of funds, presumably in return for special concessions. However, the same firms face rationing when the cost of credit reaches a critically high level. In other words, relationships help generate credit up to a point, but lose their effectiveness when the critical level of interest is reached. Interestingly, socially connected creditors appear to extend credit past the rates of interest that usually choke additional credit from business relationships.

[3] See Proposition 4 in Ghosh *et al* (1999).

Our study contributes new insights to several strands of the existing literature. We find that, even though relationships may mitigate information asymmetry problems, moral hazard concerns still constrain credit supply. This finding throws light on an important but largely untested and unsettled issue in corporate financing in emerging economies, namely to what extent informal finance can contribute to corporate and industry growth. Rajan and Zingales (1998) find that industries dependent on external finance grow disproportionately faster in countries with developed financial markets. Their study considers only formal finance, including bank credit and stock market capitalization. In less developed financial markets, however, firms with high-return projects may take recourse to inter-firm credit to overcome the deficiency of formal financing channels. Indeed, Fisman and Love (2003) document that industries with higher dependence on trade credit financing achieve higher rates of growth in countries with weak financial institutions. Trade credit providers have an advantage over banks in acquisition of information about the borrowers as well as in enforcement of loan contracts (Petersen and Rajan, 1997). This advantage is especially important in an environment with weak financial institutions. It enables trade credit receivers to commit themselves to repaying loans more credibly than bank credit. It would appear that in countries burdened with underdeveloped financial markets *as well as* a weak legal system, inter-firm credit backed by informal contracts based on relationships between firms should mitigate the information and contract enforcement problems even more effectively, and become a popular financing vehicle. We do not observe this in our data. The median firm in our sample receives relationship-based credit for only a third of its trade credit needs. Over 20% of the firms in our sample face rationing of such credit. We also find an explanation for our findings. Credit providers resort to credit rationing to avoid default caused by moral hazard problems on the part of the borrowing firms.

While there is widely documented evidence that firms in India and emerging economies, especially the smaller firms, face credit constraints in formal credit markets, ours is the first study that documents similar access problems for informal credit. Recent studies report "substantial under-lending" and "credit rationing" by Indian banks to the corporate sectors, in that the last dollar lent to a corporate borrower yields a significantly higher return than the cost of the loan. Banerjee and Duflo (2001, 2004) and Banerjee, Cole, and Duflo (2003) find that while bank credit is scarce, interest rates, though high by world standards, appeared to be below equilibrium levels for their sample of firms. Gormley (2010) finds that the entry of foreign banks

does not relax the overall credit constraints of Indian firms, especially the SMEs, since they only lend to the most profitable firms. Our finding that credit rationing exists in informal credit markets supplements the findings in the above studies. Taken together, the findings imply that small firms in India, and perhaps in other similar economies, cannot rely on informal credit to come to their rescue if they find access to formal credit difficult. They may be excluded from all credit markets at the same time. The findings underline the need for stronger formal market institutions.

In a broader context, our findings provide valuable insights into a fundamentally important issue in public policy in emerging markets. Can informal private arrangements replace formal public institutions? This is a question of great consequence, particularly for countries without well-developed public institutions. Some recent studies have implied that informal inter-firm arrangements can effectively substitute for formal legal and financial institutions, including law courts, capital markets, and banks, particularly when such institutions are weak or altogether missing (see, for example, Allen *et al*, 2005). If empirically supported, this would indeed be a very desirable outcome for many emerging economies. Starting from scratch, formal institutions are costly to build and costly to administer. Our evidence of access problems for informal credit casts doubt on this theory.

Finally, our study fills in a serious knowledge gap in the existing literature. The current literature offers little about the role informal relationships *actually* play in inter-firm credit markets, except for investigations of informal credit in Vietnam during the eighties by McMillan and Woodruff (1999a). In China, where neither the legal nor the formal financial system functions well, Allen *et al* (2005) observe that alternative financing and governance channels, based on reputation and relationships, support growth in the private sector. However, data limitations in their study preclude formal tests of this observation. Our rich and detailed survey data supplemented with documented financial information for the firms in our sample permits us to employ a comprehensive framework of analysis not attempted before. We identify the extent of informal relationship-based credit in the total inter-firm credit received by each firm in our sample. In the case of relationship-based credit, we are further able to identify the nature of the relationship in question and determine if it is primarily driven by business connections between the owners/founders of the firms (such as membership in a common trade association etc.) or by social connections (such as friends, family members, or members of the same caste etc.). We

label the first type of relationships *business relationships* and the second type *social relationships*. We also verify that our sample is free from sample selection issues and other biases that sometimes limit the value of survey data. In the next section of the paper we describe the dataset used in this study.

The rest of this paper is organized as follows. Section II below describes our data, including the survey responses and the panel data from reported financial statements. In section III, we discuss the test variables that we construct using the data. In section IV, we discuss our methodology and test results concerning supply of relationship – driven credit. The results offer evidence of credit rationing. In section V, we investigate the possible reasons for credit rationing and conduct tests to identify the set of firms in our sample that face the prospect of credit rationing. In section VI, we compare the characteristics of the set of firms that face the risk of being credit rationing with those of the other firms in our sample with a view to obtaining insights into the nature of credit-rationed firms. Finally, in section VII we present our conclusions. In the appendix at the end of this paper, we discuss the tests we carry out to confirm that our sample selection is free from non-representativeness bias.

II. Data

The dataset used in this study combines two sources of data for a sample of non–financial SME's in India: (1) panel data of trade credit transactions and other financing activities over a five-year period complied from their financial statements and (2) their responses in a survey of the role of relationships in their financing and other business decisions. The survey was conducted across India in 2006. The panel data covers the period 2001- 2005, and was obtained from the *Prowess* database of the *Centre for Monitoring the Indian Economy* (CMIE)[4]. Our strategy to construct a rich dataset by combining survey responses with secondary data on the survey respondents is similar to that of Graham *et a*l (2008).

For our analysis in this paper, we optimize the use of the two types of data in our dataset. For information relating to credit received from informal relationships and terms of credit we

[4] CMIE is a Mumbai-based economic and business information and research organization. Its *Prowess* database provides financial statements, ratio analysis, funds flows, product profiles, returns and risks on the stock markets, etc., of over ten thousand Indian companies. The database has been used in a number of well-known studies (Khanna and Palepu, 2000; Bertrand, Mehta, and Mullainathan, 2002; Gopalan, Nanda, and Seru, 2007)

rely on the survey data, and for all other financial information (such as the amount of trade credit received by a firm in a given year during 2001- 2005) on CMIE *Prowess* database. The combined data is very rich. For example, it enables us to identify the extent of informal relationship-based credit in the total inter-firm credit received by each firm in our sample. We are further able to identify the nature of the relationship in question and determine if it is primarily driven by business connections between the owners/founders of the firms (such as membership in a common trade association etc.) or by social connections (such as friends, family members, or members of the same caste etc.).

A. Corporate financial data from Prowess

Our sample includes only SMEs. Our choice of the sample was driven by two factors. The first factor is our focus on trade credit transactions. There is ample evidence that trade credit is a very important source of financing for Indian SMEs[5]. Evidence from existing studies (e.g. Allen, *et al* 2009) also indicates that trade credit transactions between Indian SMEs are often not backed by legal or even written contracts. In other words, such transactions are suitable observations on relational contracting. Second, SMEs constitute an important segment of the Indian economy. Micro enterprises and SMEs together account for 8% of India's GDP, 50% of total manufactured exports, 45% of India's total industrial employment, and 95% of all industrial units.[6]

In our sample selection we follow the official definition of an SME (*vide* Micro, Small and Medium Enterprises Development Act 2006, Government of India). The definition is different for manufacturing and services sectors. A manufacturing firm that has investments in fixed assets, including plant, machinery and equipment below Rs. 100 million (US$ 2.22 million) qualifies as an SME; for firms in the services sector, the ceiling is Rs. 50 million (US$ 1.11 million) in fixed assets.

[5] For a sample of about 9,000 Indian SME's in Allen, et.al 2009 (table 6), almost 16% of their total funding during 2001-2005 came from trade credit. It was by far the single biggest source. Using financial reports of around 2,000 *public* companies from 1990-91 to 2002-03, the *Reserve Bank of India* (2005) finds that the smaller Indian firms depend heavily on trade credit for their funding needs and much more so than the larger firms. Using balance sheet information for nearly 6,000 Indian firms during 1994-2003, Love and Peria (2004) come to a similar conclusion.

[6] See Ravi (2009)

Many SMEs in India are not organized as business units. CMIE *Prowess* database provides information on corporate financing and other firm characteristics of SMEs registered under the Indian Companies Act, 1956. For our analysis in this paper, we use corporate financial data from CMIE *Prowess* for a five−year period 2001−2005 before our survey (see below).

B. Survey data

In order to understand the nature of transactions based on informal relationships between the Indian SMEs, we conducted a survey in 2006. At the time of our survey, the *Prowess* database included 680 SMEs that satisfied two important conditions for our purpose: (1) they had no financial business, and (2) complete financial information was available for them for the previous five years (2001-2005). The last condition represents a compromise between two conflicting considerations. Relationships take time to develop and nurture which required us to consider firms with a reasonably long life. On the other hand, any time restriction of the kind introduces survivorship bias in the sample. A length of five years seemed to us sufficient for the firms to develop and cement relationships, but not long enough for the complications arising from survivorship to distort our analysis unduly. Our target population comprised the 680 firms.

The survey instrument including all the questions was designed by the researchers at Centre for Analytical Finance, Indian School of Business (ISB), Hyderabad, India. Based on a review of survey-based papers in the law and economics literature (e.g. McMillan and Woodruff, 1999a; Johnson *et* al, 2002a and 2002b), the survey questionnaire paid special attention to the important issues in the legal and financial environment in which Indian SMEs operate, while trying to avoid biases induced by the questionnaire and, at the same time, maximizing the response rate. The questions focused on company history, factors affecting company operations, corporate financing practices, relations with banks and financial institutions, informal inter-firm relationships and trade credit transactions, and business and social relationships of the owners/founders of the firms with other firms. The final survey instrument was detailed, with a total of 99 questions (most with subparts) in three sections. The survey instrument and the tabulated responses are available on request.

We did not use the telephonic or the mailed questionnaire method to administer the survey. The nature of our questions probing important business and relationships issues required us to ensure that the responses came from the owners or top executives of the surveyed units. We

also wanted to make sure that the respondents clearly understood the scope of the questions and the purpose of the survey. Accordingly, we administered the survey in face-to-face interviews with the owners or top executives of the respondent firms. We were able to administer the complete survey to 140 firms. The success rate of 21% is very encouraging, particularly given the length of the survey and our stipulation of personal interviews with top executives. We also conduct tests to verify that our sample of 140 firms is representative of the CMIE population of 680 firms in firm characteristics that are important for our analysis and used in tests in this paper (see below).

Location-wise, the surveyed firms cover almost all regions in India, with a greater concentration in Southern India (almost 41%)[7]. The sample spans more than twenty industries, including metal and crude oil extraction, engineering, chemicals, construction, real estate, wholesale and retail trade, and software. Firms manufacturing chemicals and chemical products constitute almost 15% of the sample. Construction companies, manufacturers of basic metals and manufacturers of food products & beverages account for 9%, 8% and 7% respectively of the sample. Two-thirds of the survey firms are in manufacturing, and the other one-third in services.

In 2005 (the last financial year before the survey), the sample firms ranged in age from 5 years to 129 years, with the median age of 19 years. In terms of asset size and sales, sample firms range from $0.13m to $46.31m, and from zero to $76.28m. respectively. For two-thirds of the firms, the top manager belongs to the founding family. For the larger firms (by the number of employees), the proportion increases to three-fourths. For most firms, the owner is actively involved in day-to-day management.

Table 1 below presents the summary of the survey data on location, industry age, day-to-day management, and family control for the 140 firms in our sample.

[Table 1 here]

C. Financial statistics of sample firms

Table 2 reports the summary statistics of certain important financial variables for the sample of 140 firms, such as assets, sales, costs of goods sold, internal sources of funds, trade credit, bank credit, and total borrowings. The statistics for two special sub-categories of assets, land and buildings, and plant, machinery, and property, are also reported. The statistics are based

[7] Based on registered office addresses.

on 700 firm−year observations for the period 2001 − 2005 obtained from CMIE *Prowess* database. The variables are used in the tests in this paper.

[Table 2 here]

Note from table 2 that the median sample firms are quite small, with $3.15mn. in total assets and $2.39mn. in annual sales. Internal sources represent after−tax income less dividends plus all non-cash expenses such as depreciation. It is a better measure of the cash generated by a firm than its profits the distributions of the other variables are right-skewed, with the mean values of the distributions exceeding the corresponding medians by a considerable margin. The standard deviations are usually quite high.

The table indicates that on an average trade credit is a more important source of funds for our sample of firms than bank credit. Though the median values of both variables are about the same, the mean value of trade credit, $1.22mn, is much larger than bank credit mean, 0.79mn. Based on data not reported in the table, as many as 157 firm−year observations on bank credit, 22.4% of the total of 700, are zero, indicating no credit. The corresponding number for trade credit is 6, less than 1% of the total number of observations. In this respect our data is fully consistent with the voluminous existing evidence of non−accessibility of bank finance for small firms in India (see, for example, Gormley, 2010). Apart from firm−specific issues such as small asset base and uncertain credit history, bank credit requires formal contracting facilities and a suitable legal environment (Ayyagari, Demirguc-Kunt, and Maksimovic, 2008; Beck and Martinez Peria, 2008). Therefore, in the informal sector of a developing economy, it is limited as a financing source.

D. Data biases?

As we have indicated above, the survey instrument was long and included as many as 99 questions, most of them with sub-parts. However, in the present study we use only two pieces of survey data: information relating to proportion of trade credit received from informal relationships and terms of such credit.

The survey approach allows the investigators to ask unique project-specific questions, with the possibility of generating important information that cannot be available from secondary sources. However, the approach is not without potential problems that can introduce biases in

analysis based on survey responses (see Graham *et al*, 2008). We recognize the problems and address them, as we believe, successfully.

There are problems inherent in the survey method itself. Survey questions can be misunderstood, or otherwise generate noisy information. Our method of administering the survey in face-to-face interviews with the top executives of the surveyed firms, offering each respondent an opportunity to seek clarifications if necessary, alleviates the problem. Then, self-reporting of information by the respondent is usually fraught with the risk of under-statement of undesirable traits and exaggeration of desirable traits. In this particular case, this problem is not present. The two survey questions used in the present study are not performance-related. For information relating to financial performance, we use CMIE *Prowess* data. Further, a common, and usually valid, criticism of surveys is that they offer beliefs and perceptions of the respondents, not facts. In the present case, the two survey questions are very specific and minimize this particular bias.

Finally, if the sample of surveyed firms is not representative of the population it is drawn from, statistical analysis based on the sample may generate misleading inferences about the population. However, we confirm that our sample of firms is indeed representative of the population of 680 similar firms in *Prowess* database. For the year 2005 (the last year before the survey was conducted), we conduct large sample mean difference tests between the sample firms and the 680 SME*s*[8] in respect of four firm-specific variables that are very important for our analysis in this paper. They include total assets, sales, trade credit, and bank credit. The hypothesis that the corresponding means are not statistically different is supported by the data in all cases. We do the same analysis for manufacturing and services firms separately, and again do not find significant statistical differences between the means except in one case where there is weak evidence of inequality (between mean sales for the sample firms in services and the corresponding population mean). We wanted to extend this analysis to each industry represented in our final sample. However, the sample size in each industry is too small for the purpose. We conclude that the sample used in this study is free from non-representativeness bias. The details of the test results supporting this conclusion are reported in an appendix at the end of this paper.

[8] To smoothen the distribution, we exclude outliers from the *Prowess* population by winsorizing the top and the bottom 2.5% of the firms on the basis of total assets.

III. Empirical variables

A. Proportions of relationship-based trade credit

The survey included a question asking the firms to indicate the proportion of their total trade credit coming from specific types of relationships on a 0 – 1 scale. The question mentions seven types of relationships, three of them arising from business and the other four from social interactions. Table 3A reports the question as well as the mean response for the question.

[Table 3A here]

For each firm in our sample we would like to determine the proportions of total credit received from the three relationship categories: all relationships, business relationships, and social relationships. To do so, we use two methods. First, we use a simple additive method. As an example, suppose the proportions mentioned by a sample firm for the four types of social relationships listed in the question are 5%, 10%, 10%, and 5%. Thus, 30% is the proportion of the firm's total trade credit received from all social relationship – based suppliers. Using this method for each firm in the sample that responded to the question, table 3B reports the summary statistics for the proportions of the total trade credit that the firms in our sample received from their suppliers based on all types of relationships (median 32%), only business relationships (16%), and only social relationships (10%). 122 firms responded to this question completely, and 123 firms almost completely..

[Table 3B here]

We draw the reader's attention to a few implications of the reported figures. First, the median value of the proportions of relationship-based trade credit received by the firms in our sample is 32%, indicating that the average firm in our sample depends on relationships for about a third of its credit needs. Second, every firm in our sample appears to have relationship - based suppliers, though the proportions vary considerably across our sample of firms, from 8% to 100% for credit received. Third, business relationships are more important than social relationships in getting trade credit.

While the simple additive method is very intuitive, it is also problematic. The different types of business or social relationships listed in the question are not always mutually exclusive. For example, a related party that belongs to the respondent's extended family (social relationship

type 1) often speaks the same native language (social relationship type 4). Though both associations, individually, are meaningful sources of a social relationship, a particular relationship may be over-weighted because it has both types of association with the respondent firm. To correct this, we use a second method, following Rao (1973, ch.4). Under this method, we calculate a weighting matrix such that the corresponding correlations among the four different types of social relationships listed in the question are zero. We conduct a Principal Components Analysis of the responses given by the firms for the four relationships. The weighting matrix in this case is $\Sigma^{-\frac{1}{2}} = \frac{1}{\sqrt{\lambda_1}}u_1u_1' + \frac{1}{\sqrt{\lambda_2}}u_2u_2' + \frac{1}{\sqrt{\lambda_3}}u_3u_3' + \frac{1}{\sqrt{\lambda_4}}u_4u_4'$, where Σ is the dispersion matrix of the responses, $\lambda_1, \lambda_2, \lambda_3$ and λ_4 are eigen−values of Σ and u_1, u_2, u_3 and u_4 are the corresponding eigen−vectors. We use the weights to transform the original responses. In a similar manner, we transform also the responses for the business relationships and all relationships listed in the question, and use the transformed proportions to re-compute all the figures in table 3B.

To save space, we do not report the re-computed figures. However, in our regression tests, we use the figures obtained by using the second method as a robustness check on the results using the first method. As we shall see later, the test results are virtually the same for two methods. It suggests that the survey respondents were savvy enough to guard against possible correlations between relationships in different survey questions and avoided giving undue weight to a particular relationship.

B. Volume of relationship – based credit

Using the proportion figures for a given firm in our sample, and the information about total trade credit it actually received in each year during 2001-2005 from *Prowess* database, we estimate the dollar value of relationship-based credit received by the firm during the sample period. For each firm in the sample, we compute *Credit - All Relations* (credit from other firms in relationships), *Credit - Business Relations* (credit received from business relationship-based suppliers), and *Credit – Social Relations* (trade credit received from social relationship-based suppliers). Table 3B reports the summary statistics of the relationship-based inter-firm credit received by the firms in our sample. The figures are based on 610 firm−year observations for *Credit - All Relations* and 615 firm−year observations for the other two types of credit. Though all firms in the sample reported positive proportions of credit coming from relationships,

indicating presence of ongoing relationships with credit suppliers, some 6 firm-year observations are zero. It suggests very small or no credit was received in those six cases..

The proportions underlying the dollar figures reported in the table are based on the simple (unweighted) additive method. We have also computed the dollar figures using the transformed proportions, but do not report them to save space.

C. Credit Terms

The survey questionnaire included a question asking the respondent firms to state the terms for the trade credit they receive, including the length of the credit period and the discount for timely payment.[9] A payment during the stipulated credit period qualifies for the discount. To compute the effective annualized cost of credit, we use the discounts offered along with the stipulated length of the credit period reported by the surveyed firms. For example, the median length of the credit period for the firms in the sample was 1 – 3 months, and the median discount for timely payment was 2 – 5 per cent. Using the mid-point values of the two ranges, and compounded over the year, the annualized cost of foregoing the discount (not making a timely payment) works out to 23%. In effect, the firms receive an interest-free loan for the length of the credit period.

We want to draw attention to a couple of features of the reported credit terms. The firms in the sample reported the same credit terms regardless of the type of relationship-based credit. Second, the computed costs of relationship – based credit, being based on survey responses, do not change from year to year in our analysis. This is reasonable, since the relationships underlying the costs are presumed to remain constant during the sample period. As we have discussed above, we chose a five-year sample period as a reasonable length of time for the firms to foster and cement relationships. Further, even outside of relationship – based credit, trade credit terms depend on industry norms, and change only infrequently. The last row of table 3B presents key features of the distribution of the costs. The median annual cost is 22%. The highest proportion of the computed costs is included in the 10% – 30% cost range.

[9] Question number 60 in the survey questionnaire

IV. Relationship-based trade credit

A. Identification strategy

Our objective in this paper is to investigate the challenges that small firms in India face in getting sufficient credit given their needs. The investigation requires us to identify the supply function for relationship-based credit. However, the observed level of relationship-based credit for a given firm is determined simultaneously by the both the credit extended to the firm by its suppliers as well as the firm's demand for credit. In order to estimate the credit supply function from the given data, we separate demand from supply with the help of an appropriate instrument for demand for credit. We estimate a system of two simultaneous equations indicated below, one representing credit supply and the other demand for credit, using a pooled cross-sectional two-stage least-square (*2SLS)* procedure. The demand is estimated in the second equation independently of the first. The estimated demand serves as an appropriate instrument for credit demand as we discuss below, and is used as a control variable in the first equation. The simultaneous equation system consists of the two equations below:

$$\text{Credit}_{it} = \alpha + \beta \text{Cost}_i + \theta \text{Cost}_i^2 + Controls_{it} + a_I + b_t + \epsilon_{it} \qquad (1)$$

$$CGS_{it} = Emp/TA_{it} + a_i + b_t + \nu_{it} \qquad (2)$$

The credit supply equation in (1) includes the dependent variable $Credit_{i,}$, indicating credit supplied to firm i in year t, and independent variables $Cost_i$ (cost of relationship – based credit for firm i during the sample period based on the credit terms offered to the firm, as discussed in the section above), $Cost_i^2$ (included to test for non-linearity in cost-sensitivity of supply), a set of firm-specific controls including the instrument for the firm's demand for credit obtained from equation (2) below, industry-fixed effects $a_{I,}$, year-fixed effects $b_{t\ ,}$ and error-term ε_{it}. The supply function takes into account cost of credit as reported by the firms and all firm-specific and time-related factors that may make supply of credit to the firms cross-sectionally and inter-temporally different, while controlling for their credit demand appropriately instrumented. The demand equation in (2) includes dependent variable CGS_{it} , representing cost to firm i of the goods it sells in year t, and independent variables EMP/TA_{it}, representing number of employees (scaled by total assets) used as a proxy for the labor cost of firm i in year t, firm-

fixed effects a_i, year-fixed effects b_t , and error-term v_{it}. As we discuss below, cost of goods sold less labor cost represents material cost of production which, if borrowed, is free credit during a typical trade credit contract period. Any firm, therefore, would demand this loan. The credit demand function takes into account all firm-specific and time-specific factors that can be expected to determine a firms' demand for credit if the cost of credit were effectively zero. Analytically, our procedure estimates the firm's *true* demand for credit independently of any supply-side factors. This demand estimate serves as an instrument for credit demand when estimating the credit supply function.

The key to our estimation strategy is identification of demand independently of supply. Note that, while supply depends on demand through the demand estimate used as a control variable in the supply function, by construction supply does not influence demand. Hence the connection between the two functions is in one direction only, ruling out endogeneity issues.

B. Instrumenting demand for relationship-based credit

As reported in corporate financial statements, the cost-of-goods-sold figures, CGS_{it}, include both labor cost and the cost of the material and other inputs. It is the second part of the cost that a firm typically borrows, in part or in full, from its suppliers as trade credit. However, to extract this information from the reported CGS_{it} figures, one needs an estimate of labor cost which, unfortunately, is not directly given in financial statements. We follow an indirect procedure used by Petersen and Rajan (1997). In regression model (2) above, the independent variable EMP/TA_{it}, representing number of employees (scaled by total assets), serves as a proxy for the labor cost of firm i in year t. The amount borrowed is determined by the firm's operations, its other sources of funds, and other firm-specific characteristics such as its age, industry etc. The firm's demand for credit may also vary from year to year due to time-related factors (such as boom, recession etc.). In equation (1) above, we use firm-fixed effects, indicated by a_i, to control for cross-sectional variations in all firm-level factors and year-fixed effects, indicated by b_t, to control for time-variations in demand for credit. v_{it} indicates the error term

The expected value of the dependent variable, denoted by ACGS_{it}, indicates cost-of-goods-sold (CGS_{it}) adjusted for labor cost. As we have seen in section III.D above, the effective interest cost of the amount borrowed is zero for the borrowing firm during the credit period stipulated in the contract. We presume that any firm would like to get this interest-free loan.

ACGS_{it} therefore serves as an appropriate instrument for the demand for trade credit for firm *i* in year *t*. As we observe below, the test results concerning ACGS_{it} confirm that it works well as an instrument for credit demand.

C. Estimating supply of relationship-based credit

To capture supply of credit arising from the three types of relationships – all relationships, business relationships, and social relationships - we estimate equation (1) above under three different specifications. Depending on the specification, the dependent variable, $Credit_{it}$, represents *Credit - All Relations***,** or *Credit - Business Relations,* or *Credit - Social Relations*, as defined in section III above. Since *Credit - Business Relations,* and *Credit - Social Relations* variables are constructed from the subsets of the survey responses that are used to construct *Credit - All Relations*, we are obliged to estimate the three regressions models separately. We run the three models in all tests in this paper, and report the results for the three models side by side in all tables. In each model, the dependent variable in a given period is normalized by the total assets of the firm in the same period. Normalization is done not only to reduce variability in the distribution of the dependent variable but also for another reason. Assets of a firm play an important role in the creditor's decision to extend credit to the firm, as we discuss below (and also find supporting evidence in our work). Therefore, changes in credit supplied to a firm scaled by its total assets reflect changes in the normal level of credit for the firm given its total assets. We want our tests to capture and analyze such changes.

The independent variables in (1) include trade credit terms, and firm-specific control variables including other financing sources, standard firm characteristics, and ACGS_{it}, the instrument for credit demand discussed above. Trade credit terms include two variables. $Cost_i$ indicates cost of relationship – based credit for firm *i* during the sample period based on the credit terms offered to the firm, as discussed in the section above, while $Cost_i$-square is included to check for non-linearity in cost-sensitivity of supply. The firm-specific controls include two types of control variables that are likely to influence how much credit a firm receives. Other financing sources include *Bank Loan* and *Internal Sources*. Firm characteristics include three important firm features: *Total Assets*, *Sales*, and *Age*. a_I indicates industry-fixed effects and controls for fluctuations in credit supply due to possible industry factors (such as credit providers

preferring some industries to others). b_t indicates year-fixed effects and controls for time-related fluctuations in credit supply. ε_{it} indicates error term.

We first estimate equation (1) using the dollar amounts of relationship-based credit received by the firms in our sample where the amounts reflect the unweighted proportions of relationship-based credit reported by the firms. Subsequently, as a robustness check on the first set of results, we use credit figures based on the transformed proportions after correcting for possible correlations between different types of relationships (see section III.C above). We also conduct other robustness tests and check for possible endogeneity issues. Table 4, panel A, reports the results of the first set of tests. Note that we estimate the first two models (with *Credit −All Relations* and *Credit−Business Relations* as the dependent variable) with 455 firm–year observations, based on five years of data for 91 firms. We estimate the third model (with *Credit −Social Relations* as the dependent variable) with 460 firm–year observations for 92 firms (one firm supplied all information for social relationship-based credit but not for business relationship-based credit). Though 122-123 firms had supplied all information necessary to figure out their relationship-based credit, and 106 had supplied the information for the cost of such credit (table 3B), the set of firms who had supplied both types of information numbered in the low 90's.

[Table 4 here]

From panel A, the two cost variables are highly significant (at 1% level). However, the coefficient of $Cost_i$ is positive, while the coefficient of its square term is negative. The results indicate a backward-bending supply curve of relationship-based credit with respect to its price. This finding suggests that some firms in our sample face rationing of relationship-driven credit. Credit providers are unwilling to offer any more credit when the credit cost reaches a certain level, regardless of the price of credit the borrowers are willing to offer. Our results in the table indicate that rationing kicks in, and a maximum amount of credit is supplied, at an annualized cost of 55% for credit from all relations, at 50% for credit from business relations, and at 58% for credit from social relations[10]. Intuitively, socially connected credit suppliers still offer more credit when additional credit from business relations dries up. The evidence of credit rationing at

[10] The value of $Cost_i$ that maximizes the credit supply function in (1) is given by $-\beta/2\theta$ where β indicates the regression coefficient of $Cost_i$ and θ indicates the regression coefficient of $Cost_i^2$.

a high level of interest cost supports our conjecture discussed earlier that the creditors resort to credit rationing to contain moral hazard problems on the part of the borrowers. Since the borrowers capture a small part of the returns from the use of the credit when their debt repayment obligations are excessive, the debt overhang reduces their incentive to avoid low net present value (NPV) projects with a small probability of a high upside and a high probability of default. To limit default in this scenario, the lenders do not allow interest rates to rise to a level where existing demand for credit is fully satisfied, and resort to rationing. We investigate in the next section of this paper what types of firms are likely to be credit-rationed.

Note from the table that 14% of the sample used in the test (13 out of 91 firms) indicated paying a higher rate of interest than the credit-maximizing rates. However, as we verify below, dollar volumes of credit supplied indeed go down at the higher rates, consistent with credit rationing. Therefore, 14% of the sample appear to face credit rationing.

The regression coefficient of the variable indicating financing from banks, *Bank Credit*, is negative, but significant only for the second model (*Credit - Business Relations*). In the existing trade credit finance literature, relationship between bank credit and inter-firm credit is a widely debated, but largely unsettled, issue. Generally, ability to raise bank credit, or to generate funds through internal operations, serves as a signal of the creditworthiness of the customer and qualifies the firm for more trade credit, making the two financing sources complementary with each other. Other reasons why trade credit can be an important complement to lending by financial intermediaries have also been proposed. Non-financial firms may be induced to act as intermediaries by channeling short-term funds from the financial institutions in an economy to their best use, because they may have a comparative advantage in exploiting informal means of ensuring that the borrowers repay (Demirguc-Kunt and Maksimovic, 2001). Similarly, trade credit suppliers may depend on banks to monitor their common customers (Diamond, 1984), making the two sources of credit complementary. However, for firms in relationships, the need for an external signal or agent to convey information about a partner should be limited. Besides, bank credit requires formal contracting facilities and a suitable legal environment (Ayyagari, Demirguc-Kunt, and Maksimovic, 2008; Beck and Martinez Peria, 2008). Therefore, in the informal sector of a developing economy, trade credit may substitute for bank credit. Similarly, if a customer has no access to bank loans because of adverse selection problems, and the supplier has better information about the customer and better monitoring capability, it may have to grant

the credit in order to make the sale (Biais and Gollier, 1997). In this situation again, bank loan and trade credit are substitutes for each other. This could be a particularly realistic situation if the customer and the supplier belong to a common network; the supplier will have more reliable information about the customer than the bank possibly would. Accordingly, for a firm seeking relationship – based credit in our scenario, the observed negative association between bank credit and trade credit makes sense. In an extensive empirical study of trade credit transactions of small businesses in the USA, Petersen and Rajan (1997) also find a negative association between trade credit supply to the firms in their sample and the access of the firms to financial institutions.

The variable indicating internal funds generation, *Internal Sources,* is negative and highly significant (1% level) in all three models. The result suggests that profitable firms do not get more relationship-based profit, while unprofitable firms do. The combined thrust of the results for bank credit noted above and this result is that the firms that are unsuccessful in raising funds internally as well as externally appear to have better access to relationship-based credit. A plausible explanation for the results is that the credit suppliers use the trade credit to invest in special relationships with the firms that are cut off from other sources of funds, perhaps in return for special concessions. This is an intriguing implication and sets relationship-based credit apart from other types of credit.

In many situations firm characteristics such as size, sales, and age signal firm quality and creditworthiness, and accordingly have a positive effect on trade credit received. The coefficients for *Total Assets*, *Sales*, and *Age* are all positive and significant at 1% level for *Total Assets* and *Age*. However, the value of external signals of the kind should be limited for firms in relationships. We think that firms with more assets will appear more creditworthy to the prospective lenders for a different reason. Though it is not typical for a borrowing firm to guarantee the kind of credit we consider in the present study, namely trade credit, with collaterals, availability of collateralizable assets will still be an important consideration for the lender. The creditor may think that the borrower will be persuaded to offer some of the assets in the interest of maintaining the relationship. Perhaps, in the creditor's view, enough assets will help the borrower turn around sooner. Our results may also indicate that firms with more assets and/or longer life have more resources and more time to invest in relationship-building, leading to more relationship-based credit.

The coefficient for the instrument for demand for credit for firm *i* in year *t*, denoted by A*CGS*$_{it}$, is positive for all models, and significant for *Credit – All Relations* and *Credit – Social Relations*. The results suggest that an upward shift in the demand schedule is associated with more credit supply. The results indicate that the instrument for credit demand is working as expected.

Finally, note that R^2 for the test results are very satisfactory and vary between 0.48 and 0.53 for the three models. For all test results in this paper, R^2 remains in this range.

D. Robustness check: Estimating supply of relationship-based credit with transformed credit figures

We conduct the same tests using the transformed credit received figures that are corrected for possible correlations between types of relationships reported by the survey respondents. The results are reported in panel B of table 4. In virtually every respect, the results are very similar to what we have seen for uncorrected credit figures. The coefficient of *Cost*$_i$ is positive, while the coefficient of its square term is negative, indicating a backward-bending supply curve as before. The corresponding coefficients of the two credit terms in panels A and B of table 4 are very similar and the significance levels are identical (always 1% level) in each of the three regression models (with *Credit - All Relations***,** *Credit - Business Relations,* and *Credit - Social Relations* as the dependent variable). Most importantly for our purpose, as before rationing is triggered at an annualized 55% cost for credit from all relations, 50% for credit from business relations, and at 58% for credit from social relations. The results are virtually identical also for the control variables, including other financing sources (*Bank Loan* and *Internal Sources),* and firm characteristics *(Total Assets*, *Sales*, and *Age)*, and A*CGS*.

The striking similarity of the results across all variables of the regression model leads to an interesting conclusion. The survey respondents were savvy enough to guard against possible correlations between relationships in different survey questions and avoided giving undue weight to a particular relationship. Given the closeness between the two sets of results with unweighted and transformed credit figures, in the rest of the paper we report results based on unweighted credit figures. In most cases, we run the tests also with transformed credit figures for our own verification.

E. Robustness check: Estimating supply of relationship-based credit with credit figures normalized by total credit

For another robustness check, we normalize the three types of relationship-based credit received by the firms in our sample in a given period by their total borrowings, that is credit from all sources, in the same period. This method views relationship-based credit in relation to the total indebtedness of the borrowing firm. For a prospective lender, the obligations associated with all outstanding loans of the firm will be an important consideration.

We estimate the three models (with credit from all relationships, business relationships, and social relationships as the dependent variables) with 452, 452, and 457 firm−year observations, in each case with three fewer observations than credit normalized by total assets. For one firm in the sample, total borrowings information was not available for three years. Panel C of table 4 reports the results. The coefficient of $Cost_i$ is positive and the coefficient of its square term is negative, indicating a backward-bending supply curve as before. However, compared to the base-case results in panel A of the table, the coefficients of $Cost_i$ and $Cost_i^2$, as well as the standard errors, are larger in each of the three models. Their significance levels remain the same (1%). However, the annualized costs of credit that trigger rationing are considerably lower than when credit is normalized by total assets: 41% for credit from all relations, 34% for credit from business relations, and 48% for credit from social relations. As a result, a larger pool of borrowers faces credit rationing (24% in the case of credit from all relations, 45% for credit from business relations, and 19% for credit from social relations). However, as before, socially connected credit suppliers still supply credit when additional credit from business relations dries up. Actually, in other respects also the results are intuitive and consistent with the results for credit normalized by total assets noted above. To see this, note that total borrowings plus equity of a firm equal the firm's total assets. It is an accounting identity. In other words, total borrowings of a firm at any given point of time is less than its total assets (to the extent of the firm's equity). Therefore, relationship-based credit viewed as a proportion of the total borrowings of a firm is higher than the same credit viewed in relation to the total assets of the firm. The first view focuses on the firm's total indebtedness, the second on its ability to back its debts with assets. If the creditors base their decision on the former, they will ration credit sooner (at a lower rate of interest) than when they view credit in relation to its total assets.

The results for the other financing sources – *Bank Credit* and *Internal Sources* – are negative as before, but highly significant (1% level) in each case. The coefficients for the firm characteristics *(Total Assets*, *Sales*, and *Age)* are mixed. The coefficients for *Total Assets*, positive and significant at 1% level when credit is viewed in relation to its total assets, are no longer significant. This result too is intuitive. When credit is no longer viewed in relation to total assets, a change in the firm's assets does not affect its credit availability. The coefficients for *Sales* and *Age* are positive as before, and significant in most cases. The coefficients for A*CGS* are also positive as before, but significant only in one case.

F. Endogeneity check:

We check for the possibility that relationship-based credit received by a firm may influence what assets the firm is able to procure, resulting in reverse causation between credit received and total assets. We estimate the same simultaneous equations with three variations. In the first variation total assets in the current period is replaced with total assets lagged for one period. In the second, total assets in the current period is replaced with total assets lagged for one as well as two periods. Finally, in the third variation all three specifications are included: current total assets; total assets in the previous period; and total assets in two periods before. Panels A, B and C of Table 5 report the results for the three variations.

[Table 5 here]

Note that the reported results for the coefficients of $Cost_i$ and its square term in each of the three panels of table 5 are almost identical in magnitude as well as significance level (1%) to the results for the base case (with current total assets) in table 4 before. In each panel, the coefficient for $Cost_i$ is positive and the coefficient for $Cost_i^2$ is negative. The results indicate a backward-bending supply curve with the same trigger points for credit rationing as before: 55% annualized cost for credit from all relations, 50% for credit from business relations, and 58% for credit from social relations. The results for the other financing sources, *Bank Credit* and *Internal Sources,* in the three panels are also very similar to the base-case results in table 4.

The results for *Total Assets* are interesting. In panel A, where the assets are lagged for one period, the results are very similar to the base-case results in table 4 where the assets are not lagged: positive and significant at 1% level. In panel B which includes total assets lagged for one as well as two periods as separate independent variables, the coefficient for total assets lagged

for one period changes sign and becomes insignificant while the coefficient for total assets lagged for two periods is positive and significant at 1%. The results indicate high multi-collinearity between total assets lagged for one and two periods. This is not surprising, given that total assets do not change much from year to year, especially in the case of small firms. In panel C, which includes current total assets, total assets in the previous period and total assets in two periods before as three separate variables, the coefficients for the first and third total asset variable are consistent with what we have observed before: positive and significant at 1% level. The coefficient for total assets lagged for one period is, on the other hand, negative and significant, due again to high multi-collinearity between total assets lagged for one and two periods.

The results for the other two firm characteristics, *Age* and *Sales*, are mostly similar to the base case in table 4, as are the results for *ACGS*. Based on the results of our investigations, we conclude that reverse causation between credit and total assets does not pose a problem in our framework.

G. Economic implications

Until now we have been concerned with the statistical properties of the test results. To examine the economic significance of the results, we focus on the results reported in table 4 above, since the results in table 5 have indicated that endogeneity is not a concern in our framework. We consider the results both when the credit variables are normalized by total assets of the firm (panel A, table 4), and when they are normalized by total borrowings of the firm (panel C, table 4).[11] For ease of reference, the relevant figures from table 4 and other tables are reproduced in table 6 below.

[Table 6 here]

Panel A of table 6 focuses on our results for credit normalized by total assets. The median cost of credit for the firms in our sample is 22%. Credit/total assets corresponding to the median cost is 0.09, 0.04, and 0.04 respectively for credit from all relations, business relations, and social relations. In terms of dollars, the credit figures are \$0.43m, \$0.22m, and \$0.22m. The costs of credit that trigger credit rationing are 55%, 50%, and 58% respectively for the three types of

[11] As we have noted above, the results in panel B of table 4 are very similar to the results in panel A, and therefore have similar economic significance.

credit (based on our regression results in table 4). The corresponding volumes of credit supplied are \$0.88m, \$0.43m, and \$0.43m. They represent the maximum amounts of credit that the firms in our sample receive. From this point, credit supplied declines even though the costs of credit are higher. The average credit of the three types received by the firms in our sample in this zone are \$0.67m, \$0.32m, and \$0.36m. The averages represent the averages of the relevant firm-year observations.

In Panel B of table 6, we consider our results for credit normalized by total borrowings. At the median cost of credit for the firms in our sample (22%). the three types of credit supplied are the same as before: \$0.43m, \$0.22m, and \$0.22m. However, the costs of credit that trigger credit rationing are 41%, 34%, and 48% respectively for the three types of credit (based on our regression results in table 4). As we have noted above, if the creditors base their credit decisions on the total outstanding credit of the borrowing firms rather than their total assets, they will cap credit at lower rates of interest. The corresponding volumes of credit supplied are \$0.89m, \$0.52m, and \$0.43m, representing the maximum amounts of credit that the firms in our sample receive. From this point, credit supplied declines even though the costs of credit are higher. The average credit of the three types received by the firms in our sample in this zone are \$0.73m, \$0.38m, and \$0.37m.

V. What firms are credit-rationed?

The evidence of rationing of relationship-based credit in the preceding section raises several issues that call for further investigation. Are all firms uniformly affected by it, or do some firms face the risk of credit rationing more than others and, if so, is the difference between firms in this respect caused by cross-sectional variation in certain firm characteristics? In this section we investigate the issues.

To identify the firm characteristics that influence exposure to credit rationing, we turn to our own findings in the preceding section as well as findings in the existing theoretical and empirical literature on the subject. Our tests in the last section have uniformly demonstrated that total assets have a statistically strong positive effect on relationship-based credit received by a firm, except when the creditors focus on the total indebtedness of the firm and not on its assets. The effect is also economically strong. From our base-case results in panel A, table 4, given all other things the same, a 1% change in total assets changes relationship-based credit for the

median firm by 30 basis points. We note that our results in this regard are consistent with the findings in the existing literature. Many theoretical models postulate that availability of collateralizable assets is a binding constraint on credit (Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Banerjee and Newman, 1993). Liberti and Moore (2010) empirically show that this constraint binds harder in more underdeveloped financial markets. The above studies have focused on formal finance, mostly bank loans. In informal credit markets, Ghosh *et al* (1999) demonstrate that, if the borrowing firms do not have enough assets to guarantee the full value of the loans, their effort choice under fairly general conditions will be less than first-best (see their Proposition 1). Ensuing moral hazard invokes credit rationing in their setting. We note that it is not typical for a borrowing firm to guarantee the kind of credit we consider in the present study, namely trade credit, with collaterals. However, as we have noted before, the availability of enough assets in the borrowing firm in the event of a bad outcome will still be an important consideration for a prospective creditor even when the assets are not directly pledged as collaterals.

To identify the firms that face the prospect of credit rationing, we propose to make use of the role of assets in credit availability. Accordingly, we classify the firms on the basis of total assets. We use two methods. Under the first method, we estimate the value of the average assets of each firm in our sample over the five-year sample period (2001-2005), and use that estimate to determine its rank among the entire sample of firms. In this method every firm gets a unique rank which holds constant over the sample period, with the result that if a particular firm proves to be credit-rationed it remains credit-rationed throughout the study period. Under the second method, we consider the value of total assets for each firm separately for each year, with the result that a given firm gets a different rank in different years based on its changing asset base. In this method a firm that is credit-rationed in a certain year may not be rationed in other years. Note that the second method is more general and allows a firm to move up or down in rank over the sample period. In both methods, we group the firms into deciles based on their respective ranks.

We run regression equation (1) augmented with interaction terms between the two credit terms, $Cost_i$ and $Cost_i^2$, and dummy variables indicating the position of firm i among the firms in our sample based on the value of their total assets. Equation (1′) below represents the augmented regression model

$$\text{Credit}_{it} = \alpha + \beta \text{Cost}_i + \beta_{(j)} \text{Cost}_i * Top_{(j)} + \theta \text{Cost}_i^2 + \theta_{(j)} \text{Cost}_i^2 * Top_{(j)} + Controls + a_I + b_t + \epsilon_{it} \quad (1')$$

In this equation, *TOP* (*j*) is a dummy variable taking value 1 if the firm belongs to top *j* percentile in terms of total assets in our sample of firms and zero otherwise; *j* = 10, 20, …, 90. . We estimate equation (1′) using both methods of ranking based on total assets. The two tests serve as robustness checks on each other.

A. Method 1: ranking by average assets over sample period

Panel A of table 7 presents the results of 30 tests, separately for three models with different dependent variables (*Credit - All Relations***,** *Credit - Business Relations,* and *Credit - Social Relations)* and ten percentile groups in each model.

[Table 7 here]

Note that in all three models, for the first seven groups of firms, comprising top 10 to top 70 percent of the firms based on total assets the supply curve is upward-sloping with a positive and significant coefficient for $Cost_i$ and an insignificant or a positive coefficient for the square term $Cost_i^2$. For example, for the top 70% of the firms in the first model (with *Credit - All Relations* as the dependent variable), the coefficient for $Cost_i$ and $Cost_i^2$ are 0.152 (significant at 5% level) and −0.114 (insignificant). For this group of firms, the minimum size of total assets is $2.15Mn. However, in all three models the next two groups, comprising the top 80% and top 90% firms, as well as the full sample of firms face a backward-bending supply curve, with a positive and significant coefficient for $Cost_i$ and a negative and significant coefficient for the square term $Cost_i$ (except in model 2 with *Credit - Business Relations* as the dependent variable where the coefficient for $Cost_i^2$ is negative but not significant). The results indicate credit rationing. For example, for the top 80% of the firms, with an asset size of $1.64Mn. or more, in the first model, the regression coefficients of $Cost_i$ and $Cost_i^2$ are respectively 0.161 (significant at 5% level) and −0.141 (significant at 10% level). The results indicate that a cost of 57% triggers credit rationing. Similarly, for the top 90% of the firms in the first model, with a minimum asset size of $1.10Mn, the regression coefficients are respectively 0.227 and −0.210, both significant at 1% level. In the bottom row of the table, the results for the full sample of firms are reported. We have seen the results before in panel A of table 5. The coefficient of $Cost_i$ is 0.219, while the coefficient of $Cost_i^2$ is −0.201, both significant at 1% level. Overall, the

results indicate that the bottom 20% of the firms in our sample in terms of assets face the prospect of rationing of all three types of relationship-based credit.

B. Method 2: ranking by assets in each sample year

Panel B of table 7 presents the results of 30 tests. As for the first method, the results are reported separately for three models with different dependent variables (*Credit - All Relations*, *Credit - Business Relations,* and *Credit - Social Relations)* and ten percentiles groups in each model. Note that the results are very similar to the results for the first method in panel A of the same table, except in one respect noted below. In each of the three models, the first six groups of firms, comprising top 10 to top 60 percent of the firms based on total assets, face an upward-sloping credit supply curve with a positive and significant coefficient for $Cost_i$ and an insignificant or a positive coefficient for the square term $Cost_i^2$. Also, as in the first method, in all three models the bottom two groups, comprising the top 80% and top 90% of the firms in our sample, as well as the full sample of firms face a backward-bending supply curve, with a positive and significant coefficient for $Cost_i$ and a negative and significant coefficient for the square term $Cost_i^2$. The results indicate that the bottom 20% firms in terms of asset base face credit rationing. The only difference from the results under the first method is the result for the firms in the top 70 percent group, and there too only in the third model (*Credit – Social Relations).* For this group the coefficient for $Cost_i$ is positive (0.115) and significant at 1% level, but the coefficient for $Cost_i^2$ is negative (-0.086) and mildly significant at 10% level. This result indicates that credit for social relations is rationed at 67% cost of credit and beyond for the bottom 30% firms based on total assets.

C. Robustness checks

Our findings discussed above consistently indicate that the supply curve for credit from all relations changes its shape, and credit rationing sets in, for the bottom 20% of the firms in our sample. The results are uniform for both methods of asset-based firm classification and for each of the three models. Together the results strongly suggest that the firms in the two bottom deciles by asset size face the prospect of rationing of relationship-based credit. However, it is by no means certain that all firms in the two groups are *actually* credit-rationed. Note that this result is exactly consistent with, and provides independent confirmation of, our finding in the previous section that 14% of the firms in our sample face credit rationing, judging by their cost of credit.

Additionally, the second method of firm classification offers weak evidence that firms in the bottom 20%-30% zone may also face rationing of credit from social relationships.

We have conducted several robustness checks on the above results. In the robustness tests we have used the second method of firm classification, namely ranking firms separately in each sample year, since this method is more general as we have noted above. The tests uniformly find evidence of credit rationing.

The existing literature on loan collaterals makes a sharp distinction between "firm-specific" collaterals such as plant, machinery and equipment, and inventories, and "non-specific" collaterals such as land and buildings and liquid securities (Liberti and Mian, 2010). We go through the same exercise as above with firm ranking based on the two types of assets instead of total assets. We first rank the firms in our sample on the basis of the value of their plant, machinery and equipment, and estimate the regression equation (1′) again. The test results, not reported here, indicate that the bottom 30% of the sample based on the value of their plant, machines and equipment, are candidates for credit rationing. We then rank the firms by the size of their land and buildings, and conduct the same test. The results suggest that as many as 80% of the sample firms are susceptible to credit rationing. To understand why the results are so different, note that creditors demand more non-specific assets as collaterals, since they are less susceptible to firm-specific risk, as the repayment risk of the borrowing firm increases. It follows that, for a given borrowing firm, the creditors would demand non-specific assets with a lower book value than firm-specific assets. If the firms in our sample had both types of assets in more or less equal amounts, then ranking firms by non-specific assets would make fewer of them susceptible to credit rationing than ranking by firm-specific assets. However, for our sample of firms, the situation is very different. The median firm has far more in plant, machinery and equipment ($0.71Mn.) than in land and buildings ($0.32Mn.), as can be checked from table 2 before. From data not reported in the table, as many as 12% of the 455 firm−year observations on land and buildings reported zero, indicating a negligible amount or none. The corresponding number is 5% for plant, machinery and equipment.

The test results in the previous section (section IV) uniformly indicate that firm age has a positive association with relationship-based credit, given all other things the same. Plausibly, age proxies time invested in relationship-building. To investigate this line of enquiry further, we

classify the firms in our sample on the basis of age, and find that firms below the age of sixteen, 40% of the entire sample, face credit rationing. The test results are not reported to save space.

VI. Comparing rationed and non-rationed firms

All tests in the previous section have indicated that the bottom 20% of the firms in our sample in terms of total assets are candidates for credit rationing. One test has found the bottom 30% of the sample at risk of credit rationing. Since we rank firms in each sample year separately, the numbers represent 20% or 30% of the total number of firm-year observations used in our regression tests. Panels A and B of table 8 below indicate the industry affiliations of the firms in the bottom 20% group and bottom 30% group respectively. Note that the firms are spread over as many as twenty industries. Importantly, no industry dominates. Though the chemicals and chemical products industry accounts for 3.5% of the bottom 20% and 5.3% of the bottom 30%, the numbers are commensurate with its weight in our sample. It accounts for 65 firm−year observations in our sample of 455 used in our tests, in other words 14% of the total. Clearly, credit rationing is not endemic to particular industries. The pattern suggests that the underlying factors are firm-specific rather than industry-specific.

[Table 8 here]

To gain an insight into some of the possible firm-specific factors, we compare the firms at risk of credit rationing with the other firms in the sample in terms of various firm characteristics. In the interest of thoroughness, we do the comparison at two levels: between the bottom 20% firms and the top 80%, and again between the bottom 30% firms and the top 70%. The comparison is done using a series of univariate tests between the respective groups. The results are presented in panels A and B of table 9 below.

[Table 9 here]

From panel A, the average assets of the bottom 20% group is $0.78m, while it is almost eight times as large, $6.08m, for the top 80% group. The difference between the two groups is significant at 1% level (t-value -7.38). Clearly, the bottom group is much smaller, economically as well as statistically, than the top group by asset size. From panel B, which presents the results of comparison between the bottom 30% and the top 70% firms, we get an identical picture. The average asset size of the bottom group ($1.04m) is a sixth of the top group ($6.60m), and the

difference is again significant at 1% level (t-statistic -8.75). The results vindicate our strategy to use firm asset size to identify the firms at risk of credit rationing from the other firms.

The next set of results in the two panels compare the two groups in terms of the various financing sources without adjusting for the difference in asset size of the two groups. The financing sources include total trade credit, relationship-driven trade credit, credit driven by business relationships, credit driven by social relationships, bank credit, total borrowings (all long-term and short-term debt), and internal sources. In each source, the bottom group appears to get much less than the top group, and the difference is always significant at 1% level. For example, from panel A the average trade credit from all relationships is $0.05m for the bottom 20% group and $0.95m for the top 80% group. From panel B, the corresponding numbers are $0.06m for the bottom 30% group and $1.05 for the top 70% group. In each case, the difference is significant at 1% level.

The following set of results in the two panels compare the two groups in terms of the same financing sources as before, but after adjusting for the difference in asset size of the two groups. Each type of financing for a firm is scaled by the total assets of the firm. The scaling changes some results in interesting ways. The bottom group (20% or 30% of the firms as the case may be) still does worse than the corresponding top group (80% or 70% of the firms) in terms of total trade credit, the three types of relationship-driven trade credit, and internal sources. The difference between the respective groups is significant at 1% or 5% level. However, results are dramatically different for bank borrowings and total borrowings. Adjusted for asset size, the two bottom groups have more bank credit ($0.25m) than the corresponding top groups ($0.20m and $0.19m respectively in the case of top 80% and top 70% firms), though the difference is mildly significant statistically. However, in the case of total borrowings adjusted for asset size, the bottom groups strongly dominate the top groups. While the numbers are $3.26m for the bottom 20% firms and $4.34m for the bottom 30% firms, they are $0.62m for the top 80% firms and $0.68 for the top 70% firms. In each case, the difference between the bottom and top firms is significant at 1% level. Our evidence that the firms at risk of rationing of relationship-based credit have more bank credit and other types of credit in relation to their asset base than the other firms confirm our hypothesis that debt overhang of the borrowing firms drives the creditors to ration credit. The creditors view the existing debt burden of the borrowing firms too high for the size of their assets.

The two final firm characteristics reported in table 9 are average payment period (the number of days on an average it takes a borrowing firm to pay off trade credit received) and growth rate over the sample period 2001 – 2005. Typically, the growth rate in annual sales is considered. Note from the table that the bottom groups perform far worse than the corresponding top groups in both metrics. While the average payment period is 623.6 days for the bottom 20% firms and 485.2 days for the bottom 30% firms, it is 209.6 days for the top 80% firms and 221.6 days for the top 70% firms. The growth rate during the sample period is 5.5% for the bottom 20% firms and 4.6% for the bottom 30% firms. The corresponding growth rates for the top 80% and top 70% firms are 13.5% and 12.8% respectively. In each case, the difference between the bottom and the top group of firms is significant at 1% level.

In conclusion, the results of our investigations of the difference in characteristics of the firms at risk of credit rationing and other firms in our sample are quite revealing. The former group of firms is much smaller by asset size, but have more bank credit and total credit scaled by assets than the other firms, lending credence to our hypothesis about their debt overhang problem. They take much longer to pay off their trade dues and grow at a significantly slower rate. It is no surprise that they receive less trade credit of different kinds than the other firms in absolute terms as well as adjusted for firm size.

VII. Concluding observations

Our tests in this paper have consistently found evidence of rationing of relationship-based credit. We have also found that the creditors ration credit at high rates of interest. The findings suggest that the creditors resort to credit rationing in reaction to moral hazard problems on the part of the borrowers caused by debt overhang. Since the borrowers capture a small part of the returns from the use of the credit when their debt repayment obligations are excessive, the debt overhang reduces their incentive to avoid low net present value (NPV) projects with a small probability of a high upside and a high risk of default. We have also observed that the creditors ration credit at lower rates of interest, and ration a larger proportion of the pool of borrowers, when they view credit requested in relation to the borrowing firms' total indebtedness than when they view the same credit in relation to their total assets. The latter view takes into account the ability of the borrowing firms to back their debt with assets. Interestingly, regardless how they

view credit, socially connected creditors extend credit past the rates of interest that usually choke additional credit from business relationships.

Our test results have identified the costs of credit that are high enough to trigger rationing of different types of relationship-based credit, including credit driven by business and social relationships, and the pools of borrowers who are subjected to rationing. The critical costs are in 50% – 58% range, depending on the credit type, when the creditors focus on the total assets of the borrowing firms, and in 41% – 48% range when they focus on their total debt. We have verified that the credit received by the firms in our sample actually decline at higher rates, as the model predicts.

We have probed further and documented revealing differences in characteristics between the firms at risk of credit rationing and other firms in our sample. The former group of firms is much smaller by asset size, but have more bank credit and total credit scaled by assets than the other firms, lending support to our hypothesis about debt overhang and moral hazard. They generate less funds from their operations, take much longer to pay off their trade dues and grow at a significantly slower rate. It is no surprise that they receive less trade credit, relationship-based and otherwise, than the other firms in absolute terms as well as adjusted for firm size.

However, relationships are not entirely without value in inter-firm credit markets. Our test results concerning two important control variables - internal sources of funds and bank credit – have consistently indicated that the firms that are unsuccessful in raising funds internally as well as from banks appear to have better access to relationship-based credit. A plausible explanation for the results is that the credit suppliers use the credit to invest in special relationships with the firms that are cut off from other sources of funds, presumably in return for special concessions. Interestingly, the same firms are rationed for relationship-based credit when the cost of credit reaches a critically high level, as we have noted above. In other words, relationships help generate credit up to a point, but lose their effectiveness when a critical level of interest is reached.

Credit providers resort to credit rationing to avoid default caused by moral hazard problems on the part of the borrowing firms. Even if relationships mitigate information asymmetry problems, moral hazard concerns still constrain credit supply. This is the most important finding of the present study.

Our evidence of credit rationing in informal credit markets has important policy implications. All available evidence on access to bank financing in India points to serious credit constraints, especially for the smaller firms. Recent studies document "substantial under-lending" phenomenon by Indian banks to the corporate sectors, in that the last rupee lent to a corporate borrower yields a significantly higher return than the cost of the loan (see Banerjee and Duflo, 2001, 2004; and Banerjee *et al.*,2003). The studies find that bank credit was scarce while interest rates, though high by world standards, appeared to be below equilibrium levels for their sample of firms. Gormley (2007) finds that the entry of foreign banks does not relax the overall credit constraints of Indian firms, especially the SMEs, since they only lend to the most established firms. Given this evidence, our finding of credit rationing in informal credit markets suggests that small firms in India, and possibly in other emerging economies, cannot expect informal credit to come to their rescue if they find access to formal credit difficult. They are liable to be excluded from all credit markets at the same time. The finding calls into question the theory of firm growth by informal finance espoused by some authors, and makes a case for policy interventions to strengthen formal credit markets and institutions.

Appendix

Tests for Sample Representativeness

Of the 680 non-financial SMEs in the *Prowess* database for which financial information was available for at least last five years when the survey in the present study was conducted, 140 firms responded to the survey. The sample firms account for approximately 21% of the population. Though the response rate was very satisfactory, particularly given our stipulation that the responses must be obtained in personal interviews with top executives of the surveyed firms, we wanted to ensure that the sample of 140 firms are representative of the *Prowess* SME population. To verify this, for year 2005 (the last year before the survey was conducted), we conduct large sample mean difference tests between the sample firms and the *Prowess* SME population for important firm characteristics, including total assets, sales, bank credit and trade credit. The table below reports the means of different firm characteristics with standard deviations in parentheses. As the table indicates, the hypothesis that the corresponding means are statistically different is strongly rejected in all cases. We do the same analysis for manufacturing and services firms separately, and again do not find significant statistical differences between the means except in one case where there is weak evidence of inequality (between mean sales for the sample firms in services and the corresponding population mean). We meant to extend this analysis to each industry represented in our final sample. However, the sample size in each industry is too small for the purpose.

		Surveyed Firms (1)	*Prowess* Population (2)	*p*-values (1)-(2)
No. of firms		140	680	N/A
Manufacturing (in %)		66.7	73.8	0.07
Services (in %)		33.3	26.2	0.39
Firm Characteristics (in Mn.$)				
Total Assets	*All*	5.31 (6.9)	4.29 (4.39)	0.34
	Manufacturing	4.23 (3.5)	4.06 (3.69)	0.73
	Services	7.5 (10.6)	5.04 (6.48)	0.14
Total Sales	*All*	6.91 (10.4)	6.45 (17.62)	0.75
	Manufacturing	6.75 (7.7)	5.53 (7.9)	0.39
	Services	7.23 (14.58)	8.39 (31.4)	0.06
Bank Credit	*All*	0.96 (1.6)	0.79 (1.35)	0.44
	Manufacturing	0.98 (1.26)	0.85 (1.18)	0.52
	Services	0.93 (2.28)	0.50 (1.54)	0.43
Trade Credit	*All*	1.53 (3.4)	0.84(2.23)	0.24
	Manufacturing	1.05 (1.52)	0.78 (1.26)	0.35
	Services	2.53 (5.55)	0.92 (3.79)	0.10

References

Allen F., Qian J., Qian M.,2005 "Law, finance, and economic growth in China," *Journal of Financial Economics,* No. 77, 57-116.

Allen F., Chakrabarti ,R., De,.S. Qian J., Qian M., 2009, "Financing Firms in India", unpublished

Ayyagari, Meghna, Demirgüç-Kunt, Asli, and Maksimovic, Vojislav, 2008, "How important are financing constraints? The role of finance in the business environment" *WBER,* vol. 22, no.3, 483-516

Banerjee, Abhijit, Cole, Shawn and Duflo, Esther, 2003, "Bank Financing in India", working paper, MIT

Banerjee, Abhijit, and Duflo, Esther, 2001, "The Nature of Credit Constraints: Evidence from an Indian Bank", working paper, MIT

____, ____, and ____, ____, 2004, "Do Firms Want to Borrow More? Testing Credit Constraints using a directed lending program", working paper, MIT

Beck, Thorsten, and Martinez Peria, Soledad Maria, 2008, "Bank Financing for SMEs around the world: drivers, obstacles, business models and lending practices", *WBPR WP No. 4785*

Bertrand**,** Marianne, Mehta, Paras and Mullainathan, Sendhil , "Ferreting Out Tunneling: An Application to Indian Business Groups" *The Quarterly Journal of Economics,* February 2002, Vol. 117, No. 1, Pages 121-148

Biais,Bruno and Gollier, C.,1997,"Trade Credit and Credit Rationing", *The Review of Financial Studies*,vol.10, No.4 ,pp.903-937.

Demirgüç-Kunt, Asli, and Maksimovic, Vojislav, 2001, "Firms as Financial Intermediaries: Evidence from Trade Credit Data", *World Bank Policy Research WP No. 2696*

Diamond, D. W., 1984, "Financial Intermediation and Delegated Monitoring",*Review of Economic Studies,* 393-414.

Fisman, Ray and Love, Inessa, 2003, "Trade Credit, Financial Intermediary Development, and Industry Growth" *Journal of Finance*, vol. 58(1), pages 353-374.

Ghosh, Parikshit, Mookherjee, Dilip and Ray, Debraj, 1999, "Credit Rationing in Developing Countries: An overview of the theory", *Readings in the Theory of Economic Development,* Blackwell

Gormley, Todd, 2010, "The Impact of Foreign Bank Entry in Emerging Markets: Evidence from India", *Journal of Financial Intermediation*, 19 (1), 26-51

Gopalan, Radhakrishna , Nanda, Vikram and Seru, Amit, 2007, "Affiliated Firms and Financial Support: Evidence from Indian Business Groups", *Journal of Financial Economics* 86 (3), 759-795

Graham, John R., Harvey, Campbell R., and Puri, Manju, 2008, "Managerial Attitudes and Corporate Actions,"

Johnson, Simon; McMillan, John; and Woodruff, Christopher, 2002a, "Courts and Relational Contracts", *Oxford University Press*

Johnson, Simon, McMillan, John and Woodruff, Christopher, 2002b, "Property Rights and Finance," *American Economic Review* 92, 1335-1356.

Khanna, Tarun and Palepu, Krishna, "Is Group Affiliation Profitable in Emerging Markets? An Analysis of Diversified Indian Business Groups" *The Journal of Finance*, Vol. 55, No. 2 (Apr., 2000), pp. 867-89

Love, Inessa, Maria Soledad, and Martinez Peria, 2004. "Firm Financing in India: Recent Trends and Patterns," working paper, World Bank

McMillan, John, and Christopher Woodruff 1999a "Inter-firm Relationships and Informal Credit in Vietnam", *The Quarterly Journal of Economics,* Vol.114, No.4 (Nov.1999a), pp.1285-1320

Petersen, Mitchell, and Raghuram Rajan, 1997,"Trade Credit : Theories and Evidence", *The Review of Financial Studies*, vol.10, No.3 pp.661-691

Rajan, Raghuram and Zingales, Luigi, 1998, "Financial Dependence and Growth", *American Economic Review,*88(3) 559-86.
Ravi, Shamika 2009,"Entrepreneurship Development in the Micro, Small and Medium Enterprise Sector in India" , ISB working paper
Rao, C.R., Linear Statistical Inference and its Applications, 1973, *Wiley Series*
Reserve Bank of India, 2005, "Performance of Private Corporate Sector in the Post Liberalization Period", *Reserve Bank of India Bulletin*, November
Stiglitz, J. E., Weiss, A., 1981, "Credit rationing in Markets with Imperfect Information", *American Economic Review*, Vol. 71, No.3

Table 1: Survey Data Summary

The table reports summary of survey responses from a sample of 140 firms regarding their location, industry, age, day-to-day management, and family control etc. The firms are classified by number of employees. The survey was conducted in year 2006. The responses were obtained in personal interviews with either owners or top executives of the surveyed firms.

		Number of Employees			
	All	**0-50**	**50-100**	**100-200**	**200 and above**
No. of Firms	140	36	34	33	37
(in %)		25.5	24.1	23.4	27.0
Location					
Northern India (in %)	18.4	16.7	14.7	12.1	28.9
Eastern India (in %)	9.9	2.8	14.7	21.2	2.6
Western India (in %)	30.5	33.3	17.6	42.4	28.9
Southern India (in %)	41.1	47.2	52.9	24.2	39.5
Industry					
Manufacturing (in %)	66.7	63.9	67.6	63.6	71.1
Services (in %)	33.3	36.1	32.4	36.4	28.9
Age (in Years)					
0-10 (in %)	7.1	5.6	5.9	9.1	7.9
10-20 (in %)	53.2	69.4	44.1	45.5	52.6
20 & above (in %)	39.7	25.0	50.0	45.5	39.5
Day-to-Day Management					
Owner/Partner (in %)	62.9	52.8	69.7	66.7	63.2
Hired Manager (in %)	37.1	47.2	30.3	33.3	36.8
Top Manager belonging to Founding Family					
Yes (in %)	66.7	61.1	68.8	62.5	73.7
No (in %)	33.3	38.9	31.3	37.5	26.3

Table 2: Summary Statistics of Firm Characteristics (in Mn. $)

The table reports summary statistics of key financial variables for the sample of 140 firms used in this study. The figures are based on 700 firm−year observations for the sample firms for the 5-year period 2001-2005. The data is obtained from CMIE *Prowess* database.

Variables	Obs.	Min	P1	P5	Median	Mean	P95	P99	Max	Standard Deviation
Total Assets	700	0.13	0.21	0.43	3.15	4.58	14.54	31.62	60.58	5.89
Land/Buildings	700	0.00	0.00	0.00	0.32	0.52	1.70	5.05	6.20	0.78
PME[a]	700	0.00	0.00	0.03	0.71	0.79	2.20	2.38	2.49	0.64
Total Sales	700	0.00	0.00	0.01	2.39	4.94	18.09	33.49	76.28	7.36
Cost of Goods Sold	700	0.00	0.01	0.07	2.04	4.31	15.86	30.30	68.38	6.54
Internal Sources	700	-8.01	-2.34	-0.56	0.09	0.11	0.69	1.90	7.26	0.72
Trade Credit	700	0.00	0.00	0.03	0.41	1.22	3.63	17.62	35.62	2.95
Bank Credit	700	0.00	0.00	0.00	0.43	0.79	2.78	6.65	13.52	1.31
Total Borrowings	700	0.00	0.00	0.07	1.52	2.65	7.68	26.23	37.41	4.29

[a] Plant, machinery and equipment

Table 3A: Proportion of Inter-Firm Credit from Relationship-Based Sources

The table reports the mean response to a survey question for a sample of firms used in the present study. The question is designed to determine the proportion of trade credit received from suppliers connected by either business or social relationships. 122 firms responded to the question completely. The survey was conducted in year 2006. The responses were obtained in personal interviews with either owners or top executives of the surveyed firms.

	Sample Mean	
Proportion of trade credit received from following categories of suppliers		
The supplier is located in your city/town	0.067	***Proportion of credit from business relationships***
You have some information on his reliability through industry sources	0.069	
You have met him before in a professional setting	0.064	
The supplier is related to you through your extended family	0.041	***Proportion of credit from social relationships***
The supplier is socially known to you	0.054	
The supplier belongs to your caste	0.051	
The supplier has the same native language as yours	0.055	
		Proportion of credit from relationship-based suppliers

Table 3B: Summary Statistics of Relationship-Based Inter-Firm Credit

The table reports summary statistics of proportions, volumes and costs of inter-firm credit from relationship-based sources received by a sample of firms used in the present study. The figures in the first three rows of the table are based on responses by 122 (123) firms to a survey question regarding the proportion, on a 0 – 1 scale, of total inter-firm credit coming from suppliers connected by relationships, business relationships, and social relationships. The figures in the next three rows of the table are constructed by using the survey responses and the firm-year observations of inter-firm credit actually received by the same firms during the five-year period 2001-2005. The firm-year observations were obtained from CMIE *Prowess* database. Cost of inter – firm credit information was obtained from responses to another question in the same survey. 106 firms responded to this question. The survey was conducted in year 2006. The responses were obtained in personal interviews with either owners or top executives of the surveyed firms.

Variables	Obs.	Min	P1	P5	Median	Mean	P95	P99	Max	Standard Deviation
(Scale: 0 – 1)										
Proportion of credit from relationships	122	0.08	0.10	0.13	0.32	0.40	0.89	0.95	1.00	0.25
Proportion of credit from business relationships	123	0.03	0.03	0.06	0.16	0.20	0.41	0.46	0.46	0.12
Proportion of credit from social relationships	123	0.04	0.04	0.04	0.10	0.19	0.59	0.59	0.65	0.16
(in Mn. $)										
Trade credit-All Relations	610	0.00	0.00	0.01	0.14	0.63	2.51	13.80	21.20	2.00
Trade credit-Business Relations	615	0.00	0.00	0.00	0.07	0.32	1.28	5.59	12.90	1.03
Trade credit-Social Relations	615	0.00	0.00	0.00	0.05	0.29	1.09	3.45	14.13	1.09
Cost of trade credit (%)	106	3.63	3.63	9.14	21.76	33.65	87.05	87.05	87.05	24.87

Table 4: Evidence of Rationing of Relationship – Based Credit

Panel A of table 4 reports the regression results of equation (1) in the following simultaneous equation system:

$$\text{Credit}_{it} = \alpha + \beta \text{Cost}_i + \theta \text{Cost}_i^2 + Controls_{it} + a_I + b_t + \epsilon_{it} \quad (1)$$

$$CGS_{it} = Emp/TA_{it} + a_i + b_t + \nu_{it} \quad (2)$$

The dependent variable in equation (1), **Credit**$_{it}$, represents inter-firm credit from relationship-based sources (*All Relations*, *Business Relations* and *Social Relations*), scaled by the total assets, for firm *i* in year *t*. **Cost**$_i$ and **Cost**$_i^2$ indicate cost of credit reported by firm *i* in a survey. The **Controls**$_{it}$ include other financing sources Bank Loan and Internal Sources (both scaled by total assets); firm characteristics Total Assets, Sales, and Age, and Adjusted Cost of Goods Sold (used to instrument demand for trade credit) for firm *i* in year *t*. a_I indicates industry-fixed effects, b_t indicates year-fixed effects and ε_{it} indicates error term. The dependent variable in equation (2), **CGS**$_{it}$, represents the cost of goods sold for firm *i* in year *t*. **EMP/TA**$_{it}$ represents number of employees scaled by total assets and serves as a proxy for labor cost of firm *i* in year *t*. a_i indicates industry-fixed effects, b_t indicates year-fixed effects and v_{it} indicates error term. The predicted value of **CGS**$_{it}$, from equation (2), cost of goods sold adjusted for labor cost, is used to control for demand for credit in equation (1).

Equations (1) and (2) are estimated using two-stage least-squares (2SLS). In the first two models in panel A of table 4 (with dependent variables credit−all relations and credit−business relations), the regressions are conducted with unbalanced panel data of 455 firm-year observations for 91 firms for the five-year period 2001-2005. In the third model in panel A (with dependent variable credit−social relations), 460 firm−year observations for 92 firms are used. The regressions models are estimated with constant terms, year-fixed effects, industry-fixed effects at two-digit NIC (equivalent to SIC) level. Coefficients for time dummies, industry dummies and constants not reported. Robust standard errors are reported in brackets.

Panel B of table 4 reports the regression results of equation (1) where the dependent variable, **Credit**$_{it}$,, is transformed by using proportions of relationship-based credit based on Principal Components Analysis..

Panel C of table 4 reports the regression results of equation (1) where the dependent variable, **Credit**$_{it}$,, is scaled by total borrowings of firm *i* in year *t*. The first two models are estimated with 452 firm−year observations. The third model is estimated with 457 observations. For one firm in our sample, the observations for total borrowings in three years are not available.

Independent Variables	(Panel A) Credit[a] from *All Relations*	(Panel A) Credit[a] from *Business Relations*	(Panel A) Credit[a] from *Social Relations*	(Panel B) Transformed Credit[a] from *All Relations*	(Panel B) Transformed Credit[a] from *Business Relations*	(Panel B) Transformed Credit[a] from *Social Relations*	(Panel C) Credit[b] from *All Relations*	(Panel C) Credit[b] from *Business Relations*	(Panel C) Credit[b] from *Social Relations*
Trade Credit Terms									
Cost	0.217***	0.086***	0.147***	0.216***	0.184***	0.234***	0.332***	0.119**	0.219***
	[0.060]	[0.030]	[0.037]	[0.059]	[0.064]	[0.063]	[0.107]	[0.060]	[0.065]
Cost ^{2}	-0.198***	-0.086***	-0.126***	-0.196***	-0.182***	-0.200***	-0.402***	-0.173***	-0.227***
	[0.064]	[0.033]	[0.039]	[0.063]	[0.069]	[0.067]	[0.108]	[0.059]	[0.066]
Financing Sources									
Bank Credit [a]	-0.023*	-0.015**	-0.012	-0.021*	-0.032**	-0.014	-0.173***	-0.089***	-0.088***
	[0.013]	[0.006]	[0.007]	[0.013]	[0.013]	[0.013]	[0.033]	[0.019]	[0.015]
Internal Sources [a]	-0.077***	-0.034***	-0.042**	-0.075***	-0.073***	-0.077***	-0.095***	-0.037*	-0.065***
	[0.025]	[0.011]	[0.017]	[0.025]	[0.023]	[0.028]	[0.034]	[0.019]	[0.022]
Firm Characteristics									
Total Assets [c]	0.025***	0.015***	0.011***	0.024***	0.031***	0.019***	0.001	0.008	-0.004
	[0.007]	[0.003]	[0.004]	[0.006]	[0.007]	[0.006]	[0.012]	[0.007]	[0.007]
Sales [c]	0.013	0.005	0.006	0.014	0.012	0.015*	0.038***	0.012	0.020**
	[0.009]	[0.004]	[0.005]	[0.009]	[0.009]	[0.008]	[0.014]	[0.008]	[0.008]
Age [c]	0.024***	0.013***	0.009**	0.024***	0.027***	0.022***	0.022*	0.015**	0.007
	[0.008]	[0.004]	[0.004]	[0.008]	[0.009]	[0.007]	[0.012]	[0.006]	[0.006]
Demand for Trade Credit									
Adjusted Cost of Goods Sold	0.017*	0.007	0.012**	0.016*	0.015	0.017**	0.013	0.008	0.012*
	[0.009]	[0.005]	[0.005]	[0.009]	[0.010]	[0.009]	[0.012]	[0.006]	[0.007]
Cost at maximum credit	55%	50%	58%	55%	50%	58%	41%	34%	48%
Proportion of firms paying higher cost	14%	14%	14%	14%	14%	14%	24%	45%	19%
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm−year Observations	455	455	460	455	455	460	452	452	457
No. of Firms	91	91	92	91	91	92	91	91	92
R^2	0.52	0.53	0.48	0.52	0.53	0.50	0.50	0.49	0.45

*: significant at 10%; **: significant at 5%; ***: significant at 1%; [a] Scaled by Total Assets; [b] Scaled by Total Borrowings; [c] We use Log (1+Total Sales), Log (Total Assets) and Log (1+ Age),

Table 5: Evidence of Rationing of Relationship – Based Credit
Robustness Checks

In this table we conduct the same tests as in table 4, panel A, with Total Assets lagged for one period in panel A, Total Assets lagged for both one and two periods in panel B, and Total Assets in the current period, lagged for one period, and lagged for two periods in panel C.

	(Panel A)			**(Panel B)**			**(Panel C)**		
	Credit[a] from			**Credit[a] from**			**Credit[a] from**		
Independent Variables	***Business Relations***	***Business Relations***	***Business Relations***	***Business Relations***	***Business Relations***	***Social Relations***	***All Relations***	***Business Relations***	***Social Relations***
Trade Credit Terms									
Cost	0.219***	0.088***	0.148***	0.220***	0.088***	0.151***	0.219***	0.087***	0.151***
	[0.060]	[0.030]	[0.037]	[0.060]	[0.030]	[0.037]	[0.060]	[0.030]	[0.037]
Cost [2]	-0.201***	-0.088***	-0.127***	-0.202***	-0.088***	-0.130***	-0.200***	-0.087***	-0.129***
	[0.065]	[0.033]	[0.040]	[0.065]	[0.033]	[0.040]	[0.065]	[0.033]	[0.040]
Financing Sources									
Bank Credit [a]	-0.022*	-0.014**	-0.011	-0.026*	-0.018**	-0.011	-0.022*	-0.014**	-0.011
	[0.013]	[0.006]	[0.007]	[0.015]	[0.007]	[0.008]	[0.013]	[0.006]	[0.007]
Internal Sources [a]	-0.064**	-0.028**	-0.035**	-0.066***	-0.029***	-0.034**	-0.086***	-0.041***	-0.043***
	[0.025]	[0.011]	[0.016]	[0.024]	[0.011]	[0.015]	[0.024]	[0.012]	[0.015]
Firm Characteristics									
Total Assets [c]							0.039**	0.023**	0.016*
							[0.018]	[0.011]	[0.009]
Total Assets (lag one) [c]	0.021***	0.012***	0.011***	-0.011	0	-0.011	-0.050**	-0.023*	-0.028**
	[0.006]	[0.003]	[0.003]	[0.013]	[0.007]	[0.008]	[0.022]	[0.012]	[0.012]
Total Assets (lag two) [c]				0.032***	0.012**	0.021***	0.037***	0.015**	0.024***
				[0.011]	[0.006]	[0.007]	[0.012]	[0.006]	[0.007]
Sales [a]	0.017**	0.009**	0.006	0.021**	0.010**	0.009*	0.017*	0.007	0.008
	[0.008]	[0.004]	[0.005]	[0.009]	[0.004]	[0.005]	[0.009]	[0.005]	[0.005]
Age [a]	0.025***	0.013***	0.010***	0.024***	0.013***	0.010***	0.024***	0.013***	0.010***
	[0.008]	[0.004]	[0.004]	[0.008]	[0.004]	[0.004]	[0.008]	[0.004]	[0.004]
Demand for Trade Credit									
Adjusted Cost of Goods Sold	0.015*	0.006	0.012**	0.013	0.005	0.010*	0.015	0.007	0.011**
	[0.009]	[0.005]	[0.005]	[0.009]	[0.005]	[0.005]	[0.010]	[0.005]	[0.005]
Cost at maximum credit	54%	50%	58%	55%	50%	58%	55%	50%	58%
Proportion of firms paying higher cost	14%	14%	14%	14%	14%	14%	14%	14%	14%
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm−year Observations	455	455	460	445	445	450	445	445	450
No. of Firms	91	91	92	89	89	90	89	89	90
R^2	0.52	0.52	0.48	0.53	0.53	0.50	0.53	0.54	0.50

*: significant at 10%; **: significant at 5%; ***: significant at 1%; [a]: Scaled by Total Assets; [c] We use Log (1+Total Sales), Log (Total Assets) and Log (1+ Age),

Table 6: Economic Significance of Rationing of Relationship-Based Credit

Panel A of Table 6 focuses on credit rationing results from table 4, panel A, when creditors view credit in relation to total assets of the borrowing firm (credit normalized by total assets). Panel B on the other hand focuses on credit rationing results from table 4, panel C, when creditors view credit in relation to total indebtedness of the borrowing firm (credit normalized by total borrowings).

	(Panel A)			**(Panel B)**		
	Credit/Total Assets from			**Credit/Total Borrowings from**		
	Business Relations	***Business Relations***	***Business Relations***	***Business Relations***	**Business Relations**	**Social Relations**
[a] Coefficient of *Cost*	0.22	0.09	0.15	0.33	0.12	0.22
[a] Coefficient of $Cost^2$.	-0.20	-0.09	-0.13	-0.40	-0.17	-0.23
[b] Median cost of credit	0.22	0.22	0.22	0.22	0.22	0.22
[a] Cost at maximum credit	0.55	0.50	0.58	0.41	0.34	0.48
[c] Credit/Total assets at median cost	0.09	0.04	0.04			
[c] Credit/Total borrowings at median cost				0.17	0.09	0.08
[c] Maximum credit/Total assets	0.14	0.07	0.06			
[c] Maximum credit/Total borrowings				0.20	0.09	0.13
[c] Credit/Total assets at higher cost	0.09	0.04	0.05			
[c] Credit/Total borrowings at higher cost				0.17	0.08	0.08
[c] Credit at Median Cost (in Mn. $)	0.43	0.22	0.22	0.43	0.22	0.22
[c] Maximum Credit (in Mn. $)	0.88	0.43	0.43	0.89	0.52	0.43
[c] Credit at higher cost (in Mn. $)	0.67	0.32	0.36	0.73	0.38	0.37

[a] The figures in panel A are regression estimates from table 4, panel A. The figures in panel B are from table 4, panel C.

[b] Based on credit terms reported by the sample of firms used in the present study.

[c] Based on firm−year observations obtained from CMIE *Prowess* database.

Table 7: Credit Rationing and Firm Size

Panel A of table 4 reports the regression results of equation (1′) in the following simultaneous equation system:

$$\text{Credit}_{it} = \alpha + \beta \text{Cost}_i + \beta_{(j)} \text{Cost}_i * Top_{(j)} + \theta \text{Cost}_i^2 + \theta_{(j)} \text{Cost}_i^2 * Top_{(j)} + Controls + a_I + b_t + \epsilon_{it} \quad (1')$$

$$CGS_{it} = Emp/TA_{it} + a_i + b_t + \nu_{it} \quad (2)$$

The dependent variable in equation (1), **Credit$_{it}$**, represents inter-firm credit from relationship-based sources (*All Relations*, *Business Relations* and *Social Relations*), scaled by the total assets, for firm *i* in year *t*. **Cost$_i$** and **Cost$_i^2$** indicate cost of credit reported by firm *i* in a survey. ***TOP$_{(j)}$*** is a dummy variable taking value 1 if the firm belongs to top *j* percentile based on *average total assets* over the sample period 2001-2005 and zero otherwise; where *j* = 10, 20,...,90.. The **Controls$_{it}$** include other financing sources Bank Loan and Internal Sources (both scaled by total assets); firm characteristics Total Assets, Sales, and Age, and Adjusted Cost of Goods Sold (used to instrument demand for trade credit) for firm *i* in year *t*. a_I indicates industry-fixed effects, b_t indicates year-fixed effects and ε_{it} indicates error term. The dependent variable in equation (2), **CGS$_{it}$**, represents the cost of goods sold for firm *i* in year *t*. **EMP/TA$_{it}$** represents number of employees scaled by total assets and serves as a proxy for labor cost of firm *i* in year *t*. a_i indicates industry-fixed effects, b_t indicates year-fixed effects and v_{it} indicates error term. The predicted value of **CGS$_{it}$**, from equation (2), cost of goods sold adjusted for labor cost, is used to control for demand for credit in equation (1).

Panel B reports the regression results of equation (1′) where ***TOP$_{(j)}$*** is a dummy variable taking value 1 if the firm belongs to top *j* percentile in terms of total assets *in a given year* and zero otherwise. The dynamic assignment allows the firms to move across the deciles in each year.

Equations (1) and (2) are estimated using two-stage least-squares (2SLS) and the same data as in table 4. In the first two models in panel A of table 4 (with dependent variables credit−all relations and credit−business relations), the regressions are conducted with unbalanced panel data of 455 firm-year observations for 91 firms for the five-year period 2001-2005. In the third model in panel A (with dependent variable credit−social relations), 460 firm−year observations for 92 firms are used. The regressions models are estimated with constant terms, year-fixed effects, industry-fixed effects at two-digit NIC (equivalent to SIC) level. The table reports the coefficients for **Cost$_i$** and **Cost$_i^2$** only. Robust standard errors are reported in brackets. The coefficients for all other independent variables, time dummies, industry dummies and constants are not reported to save space.

	Panel A: Percentiles based on average assets during 2001-05			*Panel B: Percentiles based on assets distribution each year 2001-05*		
Credit costs	***All Relations***	***All Relations***	***All Relations***	***All Relations***	***Business Relations***	***Social Relations***
Top 10 percentile						
Cost $(\beta + \beta_{(10)})$	0.336*** [0.040]	0.218*** [0.013]	0.121 [0.047]	0.220** [0.053]	0.140*** [0.020]	0.097 [0.050]
Cost^2 $(\theta + \theta_{(10)})$	0.011 [1.1]	-0.054 [0.068]	0.058 [0.232]	0.152 [0.118]	0.037 [0.094]	0.095 [0.129]
Top 20 percentile						
Cost $(\beta + \beta_{(20)})$	0.116 [0.128]	0.096 [0.038]	0.033 [0.143]	0.125 [0.093]	0.071 [0.038]	0.067 [0.070]
Cost^2 $(\theta + \theta_{(20)})$	0.243* [0.087]	0.078 [0.057]	0.144 [0.079]	0.260** [0.065]	0.078 **[0.029]	0.127 [0.095]
Top 30 percentile						
Cost $(\beta + \beta_{(30)})$	0.258*** [0.038]	0.135*** [0.019]	0.146** [0.027]	0.049 [0.169]	0.113 [0.233]	0.058 [0.062]
Cost^2 $(\theta + \theta_{(30)})$	-0.064 [0.32]	-0.035 [0.116]	-0.063 [0.161]	0.231* [0.083]	0.129 **[0.029]	0.077 [0.148]
Top 40 percentile						
Cost $(\beta + \beta_{(40)})$	0.067*** [0.108]	0.014 [0.127]	0.083[0.038]	0.066 [0.103]	0.020 [0.090]	0.071 [0.036]
Cost^2 $(\theta + \theta_{(40)})$	0.145*** [0.111]	0.093*** [0.036]	0.009 [0.9]	0.075 [0.183]	0.045 [0.071]	-0.003 [3]
Top 50 percentile						
Cost $(\beta + \beta_{(50)})$	0.098 [0.070]	0.019 [0.090]	0.109** [0.039]	0.111[0.058]	0.041 [0.40]	0.093** [0.024]
Cost^2 $(\theta + \theta_{(50)})$	0.034 [0.377]	0.044 [0.068]	-0.05 [0.042]	-0.031 [0.310]	0.015 [0.15]	-0.040 [0.093]
Top 60 percentile						
Cost $(\beta + \beta_{(60)})$	0.151** [0.039]	0.054 [0.028]	0.119*** [0.017]	0.137* [0.037]	0.053 [0.028]	0.098** [0.019]
Cost^2 $(\theta + \theta_{(60)})$	-0.097 [0.087]	-0.04 [0.052]	-0.082 [0.038]	-0.086 [0.085]	-0.042 [0.052]	-0.058 [0.050]
Top 70 percentile						
Cost $(\beta + \beta_{(70)})$	0.152** [0.030]	0.062* [0.018]	0.099** [0.017]	0.160** [0.029]	0.058* [0.019]	0.115*** [0.015]
Cost^2 $(\theta + \theta_{(70)})$	-0.114 [0.054]	-0.055 [0.025]	-0.064 [0.038]	-0.127 [0.047]	-0.053 [0.027]	-0.086* [0.028]
Top 80 percentile						
Cost $(\beta + \beta_{(80)})$	0.161** [0.028]	0.052 [0.022]	0.119*** [0.015]	0.170** [0.026]	0.056* [0.019]	0.127*** [0.013]
Cost^2 $(\theta + \theta_{(80)})$	-0.141* [0.041]	-0.051 [0.028]	-0.096** [0.024]	-0.150* * [0.037]	-0.057 [0.025]	-0.120** [0.024]
Top 90 percentile						
Cost $(\beta + \beta_{(90)})$	0.227*** [0.021]	0.092*** [0.013]	0.143*** [0.013]	0.185*** [0.024]	0.069** [0.016]	0.128*** [0.014]
Cost^2 $(\theta + \theta_{(90)})$	-0.210*** [0.026]	-0.093** [0.014]	-0.123*** [0.018]	-0.169** [0.030]	-0.070** [0.017]	-0.108** [0.019]
All						
Cost (β)	0.219*** [0.064]	0.087*** [0.032]	0.148*** [0.039]	0.219*** [0.064]	0.087*** [0.032]	0.148*** [0.039]
Cost^2 (θ)	-0.201*** [0.068]	-0.087** [0.035]	-0.128*** [0.042]	-0.201*** [0.068]	-0.087** [0.035]	-0.128*** [0.042]
Firm year Observations	455	455	460	455	455	460

*: significant at 10%; **: significant at 5%; ***: significant at 1%;

Table 8: Industry Classification of Firms at Risk of Credit Rationing

This table reports industry classification according to two−digit NIC code (comparable to SIC code) of firms that are at risk of credit rationing. All firms included in the sample of firms used in the present study are ranked by the size of their total assets in each year during the sample period 2001−2005. As predicted in table 6, bottom 20% or 30% of a total of 455 firm−years are at risk.

	Panel A		Panel B	
Industry	**Bottom 20 Firm−Year Obs.**	**Percent**	**Bottom 30 Firm−Year Obs.**	**Percent**
Manufacture of chemicals and chemical products	15	3.3	23	5.1
Manufacture of textiles	6	1.3	10	2.2
Manufacture of food products and beverages	6	1.3	9	2.0
Manufacture of radio, television and communication devices	6	1.3	9	2.0
Manufacture of furniture; manufacturing	4	0.9	8	1.8
Computer and related activities	5	1.1	7	1.5
Construction	5	1.1	6	1.3
Manufacture of machinery and equipment	4	0.9	6	1.3
Wholesale trade and commission trade	4	0.9	6	1.3
Manufacture of other non-metallic miner	4	0.9	5	1.1
Manufacture of rubber and plastic products	4	0.9	5	1.1
Manufacture of basic metals	4	0.9	5	1.1
Manufacture of motor vehicles, trailers	4	0.9	5	1.1
Mining of coal and lignite; extraction	3	0.7	5	1.1
Miscellaneous goods and services	4	0.9	5	1.1
Real estate activities	4	0.9	5	1.1
Recreational, cultural and sporting activities	4	0.9	5	1.1
Retail trade, except of motor vehicles	5	1.1	5	1.1
Land transport; transport via pipelines	0	0.0	3	0.7
Manufacture of fabricated metal product	0	0.0	3	0.7
Other business activities	0	0.0	2	0.4
Total	91	20.0	137	30.0

Table 9: Comparing Firms at Risk of Rationing and Other Firms

Table 9 reports results of univariate tests of difference in firm characteristics between the set of firms identified as candidates for credit rationing and others firms included in the sample used in the present study. All firms are ranked by the size of their total assets in each year during the sample period 2001−2005. As predicted in table 6, bottom 20% or 30% of a total of 455 firm−years are at risk. Panel A of the table reports the results for the tests between bottom 20% and top 80% of firm−year observations. Panel B of the table reports the results for the tests between bottom 30% and top 70% of firm−year observations.

	Panel A				**Panel B**			
	Bottom 20 mean	**Top 80** mean	t stat	p-value	**Bottom 30** mean	**Top 70** mean	t stat	p-value
Total Assets *(in Mn.$)*	0.78	6.08	-7.38	0.00	1.04	6.60	-8.75	0.00
Financing Sources (in Mn.$)								
Trade Credit	0.15	1.77	-4.32	0.00	0.19	1.95	-5.24	0.00
Trade Credit -All Relations	0.05	0.95	-3.58	0.00	0.06	1.05	-4.36	0.00
Trade Credit -Business Relations	0.03	0.48	-3.49	0.00	0.04	0.53	-4.24	0.00
Trade Credit - Social Relations	0.02	0.45	-3.11	0.00	0.02	0.50	-3.83	0.00
Bank Credit	0.19	1.05	-5.41	0.00	0.25	1.13	-6.12	0.00
Total Borrowings	0.75	3.47	-8.04	0.00	0.60	3.17	-6.51	0.00
Internal Sources	-0.02	0.00	-4.07	0.00	-0.02	0.01	-4.68	0.00
Financing Sources (scaled by Total Assets)								
Trade Credit	0.20	0.23	-1.62	0.05	0.19	0.24	-2.59	0.01
Trade Credit -All Relations	0.06	0.10	-3.48	0.00	0.06	0.10	-4.33	0.00
Trade Credit -Business Relations	0.03	0.05	-3.10	0.00	0.03	0.05	-3.64	0.00
Trade Credit - Social Relations	0.02	0.05	-3.75	0.00	0.02	0.05	-5.17	0.00
Bank Credit	0.25	0.20	1.66	0.05	0.25	0.19	1.93	0.03
Total Borrowings	3.26	0.62	8.32	0.00	4.34	0.68	10.27	0.00
Internal Sources	-0.07	0.02	-2.82	0.00	-0.06	0.02	-3.37	0.00
Other Characteristics								
Average Payment Period	623.55	209.59	2.71	0.00	485.20	221.62	1.90	0.03
Growth in Sales 2001-05 (in %)	5.46	13.52	-1.72	0.04	4.60	12.80	-2.57	0.01