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## **The Benefits of Lending Relationships: Evidence from Small Business Data**

MITCHELL A. PETERSEN and RAGHURAM G. RAJAN\*

### **ABSTRACT**

This paper empirically examines how ties between a firm and its creditors affect the availability and cost of funds to the firm. We analyze data collected in a survey of small firms by the Small Business Administration. The primary benefit of building close ties with an institutional creditor is that the availability of financing increases. We find smaller effects on the price of credit. Attempts to widen the circle of relationships by borrowing from multiple lenders increases the price and reduces the availability of credit. In sum, relationships are valuable and appear to operate more through quantities rather than prices.

IN A FRICTIONLESS CAPITAL MARKET, funds will always be available to firms with positive net present value investment opportunities. In practice, managers of small firms often complain of not being able to borrow enough capital at reasonable rates. Economic theorists (for example, see Stiglitz and Weiss (1981)) suggest that market frictions such as information asymmetries and agency costs may explain why capital does not always flow to firms with profitable investment opportunities. Developing on this theme, other economists (see Leland and Pyle (1977), Campbell and Kracaw (1980), Diamond (1984), Fama (1985), Haubrich (1989), and Diamond (1991)) describe how large institutional creditors can (partially) overcome these frictions by producing information about the firm and using it in their credit decisions. If scale economies exist in information production, and information is durable and not easily transferred, these theories suggest that a firm with close ties to financial institutions should have a lower cost of capital and greater

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availability of funds relative to a firm without such ties.<sup>1</sup> We term these ties relationships.

In recent years, a number of empirical studies have investigated the benefits of firm-creditor relationships. In a series of papers, Hoshi, Kashyap, and Scharfstein (1990a, 1990b, 1991) find that firms in Japan with close ties to their banks are less likely to be liquidity constrained in their investments than firms that do not have such ties. Furthermore, firms with close ties are more able to invest when they are financially distressed, suggesting again that banking relationships help overcome frictions impeding the flow of credit. For the United States, James (1987), Lummer and McConnell (1989), and James and Wier (1990) find that the existence or renewal of a banking relationship is a positive signal to the stock market. Shockley and Thakor (1992) find a similar effect for loan commitments.

Our paper differs from the ones cited above in that we use more detailed measures of the strength of firm-creditor relationships. Furthermore, we estimate the effects of relationships on both the availability and the price of credit. To the extent that we can do so accurately, we provide evidence on the precise channel or channels through which relationships benefit the firm.<sup>2</sup>

The data we use are from the National Survey of Small Business Finance collected by the U.S. Small Business Administration (SBA). The sample is well suited for our purposes. Only firms with fewer than 500 employees were included in the sample. The firms have a median size of book assets of \$130,000 and median sales of \$300,000. Since these firms are small, they are unlikely to be monitored by rating agencies or the financial press. As a result, there may be large information asymmetries between these firms and potential public investors. Furthermore, most of these firms are relatively young, with a median age of 10 years. In comparison, firms in the largest decile of New York Stock Exchange stocks have been listed for a median of at least 33 years. Since the youngest firms in our sample do not have much of a track record, a potential lender is uncertain about the competence and trustworthiness of the management, as well as the kinds of investment opportunities that could arise. If lenders remain at arm's length, management can indulge in pet projects, shift risk toward the fixed claim creditors, or otherwise misuse the borrowed funds. Some theorists have argued this is why small and young firms can rarely borrow in the public capital markets, and why we would expect firm-creditor relationships to be especially important in this sample (Diamond (1991)).

Apart from being an ideal testing ground for the theory, small firms are an important component of the national economy, producing 38 percent of gross

<sup>1</sup>Roosa (1951) appears to be the first to discuss the effect of bank-customer relationships in an environment with credit rationing. The recent theoretical developments discussed above have rekindled interest in the issue after a long hiatus. It should be noted that there are a few theorists who do not agree that stronger bank-creditor relations will always increase a firm's access to capital (for an example, see Blackwell and Santomero (1982)).

<sup>2</sup>Berger and Udell (1992), use the same data set as we do and find that a lender is less likely to demand collateral if a firm has had a long relationship with it.

national product (Dennis, Dunkelberg, and Van Hulle (1988)) and employing half of the work force (Brown, Hamilton, and Medoff (1990)). Some of these firms may be the industrial giants of the future. An important measure of the efficiency of a financial system is the extent to which such firms are nurtured and have access to the capital necessary for growth. This study is also a step toward understanding that process.

In the next section we discuss how, in theory, relationships can reduce frictions in the flow of capital from potential lenders to borrowers. This provides the basis for defining our relationship variables. Section II describes the borrowing patterns of small firms as they grow older and larger. Small firm borrowing is heavily concentrated among a few lenders, with banks being the predominant source. In Section III we examine the empirical determinants of the interest rate on the firm's most recent loan, and in Section IV the determinants of the availability of credit. This study provides evidence that relationships increase the availability and reduce the price of credit to firms. Furthermore, firms appear to reap the benefits of relationships more from increases in the quantity of finance made available by institutional lenders than through reductions in its price. Section V concludes with policy implications.

## **I. Theories**

In most markets, prices adjust to equate demand and supply. It has been argued that the capital market is special in that the interest rate need not always adjust to clear the market. Stiglitz and Weiss (1981) show that the rate charged, to an ex ante observationally equivalent group of borrowers, determines not only the demand for capital but also the riskiness of the borrowers. A higher interest rate either draws riskier applicants (the adverse selection effect) or influences borrowers to choose riskier investments (the incentive or moral hazard effect). If an increase in the interest rate increases the average riskiness of borrowers, lenders may optimally choose to ration the quantity of loans they grant rather than raise the rate to clear the market.

As discussed earlier, adverse selection and moral hazard may have a sizeable effect when firms are young or small, which may explain why they find it hard to raise money in the public markets. However, through close and continued interaction, a firm may provide a lender with sufficient information about, and a voice in, the firm's affairs so as to lower the cost and increase the availability of credit. We term this interaction a relationship. We now examine its various dimensions.

An important dimension of a relationship is its duration. The longer a borrower has been servicing its loans, the more likely the business is viable and its owner trustworthy (Diamond (1991)). Conditional on its past experience with the borrower, the lender now expects loans to be less risky. This should reduce its expected cost of lending and increase its willingness to

provide funds. It is possible that the lender could obtain sufficient information on the firm's ability to service debt-like claims by observing its past interactions with other fixed claim holders like employees or prior creditors. If so, the age of the firm rather than the length of the financial relationship should determine the lender's cost and the availability of funds. Alternatively, the information generated within a financial relationship may not be observable (or transferable) to outsiders. If so, the length of the relationship should exert an independent influence.

In addition to interaction over time, relationships can be built through interaction over multiple products. Borrowers may obtain more than just loans from a lender, especially if the lender is a bank. Firms can purchase a variety of financial services from their lender and also maintain checking and savings accounts with it. These added dimensions of a relationship can affect the firm's borrowing in two ways. First they increase the precision of the lender's information about the borrower. For example, the lender can learn about the firm's sales by monitoring the cash flowing through its checking account or by factoring the firm's accounts receivables. Second, the lender can spread any fixed costs of producing information about the firm over multiple products. Both effects reduce the lender's costs of providing loans and services, and the former effect increases the availability of funds to the firm.

We have argued above that relationships can reduce the lender's expected cost of providing capital. Whether the cost savings are passed along in the form of lower loan rates, however, depends on how competitive the capital market for small firms is. The state of competition depends, of course, on the number of potential lenders in the market and on how informed they are. If, as discussed earlier, the information generated in prior relationships can be verified by potential new lenders, they can compete on par with the current lender. If the information cannot be verified by new lenders, the current lender acquires an informational monopoly over the firm. Greenbaum, Kanatas, and Venezia (1989), Sharpe (1990), and Rajan (1992) argue that this allows the current lender to extract the rents attributable to knowing that the borrower is less risky than average. Hence, if the information generated in the relationship is private to the lender and not transferable by the borrower to others, the relationship reduces the interest rate by less than the true decline in cost. Even though these theories imply that the effect of close firm-creditor ties on the cost of funds is ambiguous, in general, the availability of funds should increase.<sup>3</sup>

## II. Data

### *A. Sample Description*

The data in this study are obtained from the National Survey of Small Business Finances. The survey was conducted in 1988 and 1989 under the guidance of the Board of Governors of the Federal Reserve System and the

<sup>3</sup>If the (ex post) monopoly distorts the firm's investment incentives excessively, availability of funds could decrease (see Rajan (1992)). If the bank can freely dispose of its monopoly power, for example with loan commitments, availability will always increase.

**Table I**  
**Distribution of Sample Firms by Industry**

This table contains the distribution of firms in our sample by the one-digit SIC code.

| Industry                     | Number of Firms | Asset Size (in 1,000s of Dollars) |       |        |         | Firm Age (in Years) |        |
|------------------------------|-----------------|-----------------------------------|-------|--------|---------|---------------------|--------|
|                              |                 | Min.                              | Mean  | Median | Max.    | Mean                | Median |
| Mining                       | 26              | 30                                | 3,129 | 464    | 32,317  | 12.5                | 7.0    |
| Construction                 | 447             | 1                                 | 708   | 103    | 12,000  | 14.2                | 12.0   |
| Manufacturing                | 408             | 1                                 | 2,839 | 452    | 154,087 | 16.4                | 12.0   |
| Utilities and transportation | 117             | 7                                 | 1,778 | 275    | 62,983  | 13.3                | 10.0   |
| Wholesale trade              | 344             | 1                                 | 1,671 | 302    | 35,945  | 15.1                | 12.0   |
| Retail trade                 | 930             | 1                                 | 589   | 114    | 22,820  | 12.2                | 9.0    |
| Insurance and real estate    | 194             | 1                                 | 692   | 153    | 10,671  | 15.7                | 12.0   |
| Services                     | 938             | 1                                 | 591   | 82     | 69,073  | 13.8                | 10.0   |

SBA. It targeted nonfinancial, nonfarm small businesses which were in operation as of December, 1987.<sup>4</sup> Financial data were collected only for the last fiscal year. The sample was stratified by census region (Northeast, North Central, South, and West), urban or rural location (whether the firm was located in a metropolitan statistical area (MSA)), and by employment size (less than 50 employees, 50 to 100 employees, more than 100 employees and less than 500 employees (the maximum size in the sample)). The stratification was done to insure that large and rural firms are represented in the sample. The response rate was 70 to 80 percent, depending upon the section of the questionnaire considered.

There are 3,404 firms in the sample, of which 1,875 are corporations (including S corporations) and 1,529 are partnerships or sole proprietorships. Nearly 90 percent of these firms are managed by the owner or owners. Twelve percent are owned by women and 7 percent by minorities. Small firms are concentrated in businesses that require less capital assets. Nearly 28 percent of the firms in our sample are in the service industry. These firms are the smallest when measured on the basis of the book value of assets (see Table I). Another 27 percent of the firms are in the retail trade industry. The largest firms on the basis of book assets are manufacturing firms, which comprise 12 percent of our sample.

### *B. Firm Borrowing Patterns*

Before turning to the impact of relationships on the financing of small firms, we describe the pattern and sources of borrowing for firms in our sample. The corporations are significantly larger than the proprietorships or partnerships. The mean book value of assets for corporations is \$1.7 million

<sup>4</sup>Firms involved in the agriculture, forestry, and fishing industries, finance and insurance underwriting, or real estate investment trusts were excluded from the survey.

compared to \$0.25 million for sole proprietorships and partnerships. Controlling for firm size, the corporations and noncorporations appear equally levered. The institutional debt-to-asset ratio (institutional debt excludes debt from the owners or their families) is almost identical—27 percent for corporations versus 24 percent for sole proprietorships and partnerships. These ratios conceal the large difference in the fraction of firms that have no debt. Twenty-eight percent of the corporations and 45 percent of noncorporations (sole proprietorships and partnerships) have no institutional borrowing.<sup>5</sup> Although more corporations have external debt financing, conditional on having institutional debt they have less leverage. The institutional debt-to-asset ratio, conditional on having institutional debt, is 43 percent for noncorporations versus 37 percent for corporations.

For firms with debt, Table II, Panel A shows the average borrowing from different sources when firms are grouped by size (book value of assets). The smallest 10 percent of firms in our sample borrow about 50 percent of their debt from banks.<sup>6</sup> Another 27 percent comes from the firm's owners and their families. The table shows that the fraction from personal (owner and family) sources declines to 10 percent for the largest 10 percent of firms in our sample. The fraction from banks increases to 62 percent for this group. There is no clear variation of borrowing with firm size for the other sources.

With the growing deregulation in the eighties, the distinction between banks and other financial institutions is perhaps not as clear as it once was. Therefore, we classify institutions as close if the firm obtains at least one financial service from it. Financial services include depository services—like providing checking and savings accounts—and services that provide the lender information about the firm's business—like cash management services, bankers acceptances, credit card processing, pension fund management, factoring, or sales financing. This classification attempts to capture how close the working relationship between the financial institution and the firm is. Approximately half of the institutional borrowing comes from close lenders. The fraction of institutional loans from close institutions increases from 0.45 to 0.62 as firm size increases.

Table II, Panel B describes the variation of corporate borrowing with firm age where age is defined as the number of years under current ownership.<sup>7</sup> The youngest firms (age less than or equal to 2 years) rely most heavily on loans from the owner and his or her family. These firms also use bank loans. In their initial years, their largest incremental source of funds is from banks, while they secularly reduce their dependence on personal funds. Eventually

<sup>5</sup>Firms may have unused credit lines—these would not show up in our loan volume data.

<sup>6</sup>We classify commercial banks, savings and loans associations, savings banks, and credit unions as Banks. Finance companies, insurance companies, brokerage or mutual fund companies, leasing companies and mortgage banks are classified as Nonbank Financial Institutions. We also have loans made by nonfinancial firms. The remaining loans consist of venture capitalist loans, loans from government agencies, and otherwise unclassified loans.

<sup>7</sup>We also measure age as the number of years since the firm was founded and obtained similar results.

Table II  
Amount and Sources of Borrowing: By Size and Age

The first row is based on the smallest 10 percent of firms (book assets of less than \$15,000). The asset percentiles are based on the entire sample ( $N = 3,404$ ). The average debt is calculated for firms with debt only. The fraction of total borrowing, from different sources is described for firms that have debt. These percentages do not sum to 100 percent since the “not otherwise classified” category is not included. The  $F$ -statistic tests the equality of the means in each column. The last column contains the fraction of debt which firms obtain from close lenders. Close lenders are institutions which also provide the firm with at least one financial service. These include checking and savings accounts, cash management services, bankers acceptances, credit card processing, pension fund management, factoring, or sales financing.

| Panel A: Sources of Borrowing: By Size |                      |                                     |                   |        |                                    |                                     |       |        |                |                                                         |
|----------------------------------------|----------------------|-------------------------------------|-------------------|--------|------------------------------------|-------------------------------------|-------|--------|----------------|---------------------------------------------------------|
| Book Value<br>of Assets<br>(\$1,000)   | Assets<br>Percentile | Percentage<br>of Firms<br>with Debt | Debt<br>(\$1,000) |        | Fraction Borrowed from Each Source |                                     |       |        |                |                                                         |
|                                        |                      |                                     | Mean              | Median | Bank                               | Nonbank<br>Financial<br>Institution | Owner | Family | Other<br>Firms | Fraction of<br>Institutional Debt<br>from Close Lenders |
|                                        |                      |                                     |                   |        |                                    |                                     |       |        |                |                                                         |
| Less than 15                           | 0-10                 | 0.34                                | 9                 | 6      | 0.51                               | 0.10                                | 0.13  | 0.14   | 0.04           | 0.45                                                    |
| 15-46                                  | 10-25                | 0.55                                | 17                | 12     | 0.56                               | 0.12                                | 0.11  | 0.09   | 0.03           | 0.52                                                    |
| 46-130                                 | 25-50                | 0.71                                | 36                | 28     | 0.58                               | 0.11                                | 0.09  | 0.11   | 0.03           | 0.55                                                    |
| 130-488                                | 50-75                | 0.82                                | 107               | 80     | 0.55                               | 0.11                                | 0.11  | 0.09   | 0.04           | 0.54                                                    |
| 488-2,293                              | 75-90                | 0.91                                | 438               | 300    | 0.60                               | 0.12                                | 0.10  | 0.05   | 0.03           | 0.61                                                    |
| Over 2,293                             | 90-100               | 0.91                                | 2933              | 1585   | 0.62                               | 0.14                                | 0.07  | 0.03   | 0.04           | 0.62                                                    |
| $F$ -statistic                         |                      |                                     |                   |        | 2.10                               | 0.40                                | 1.59  | 6.07   | 0.21           | 2.74                                                    |
| $p$ -value                             |                      |                                     |                   |        | 0.06                               | 0.85                                | 0.16  | 0.00   | 0.96           | 0.02                                                    |
| Panel B: Sources of Borrowing: By Age  |                      |                                     |                   |        |                                    |                                     |       |        |                |                                                         |
| Less than 2                            | 0-10                 | 0.79                                | 648               | 40     | 0.49                               | 0.09                                | 0.10  | 0.17   | 0.05           | 0.52                                                    |
| 2-5                                    | 10-25                | 0.77                                | 395               | 61     | 0.54                               | 0.12                                | 0.14  | 0.11   | 0.03           | 0.60                                                    |
| 5-10                                   | 25-50                | 0.77                                | 334               | 53     | 0.58                               | 0.11                                | 0.10  | 0.09   | 0.04           | 0.57                                                    |
| 10-19                                  | 50-75                | 0.74                                | 410               | 54     | 0.63                               | 0.12                                | 0.08  | 0.05   | 0.03           | 0.57                                                    |
| 19-30                                  | 75-90                | 0.71                                | 695               | 96     | 0.60                               | 0.14                                | 0.10  | 0.04   | 0.04           | 0.55                                                    |
| Over 30                                | 90-100               | 0.59                                | 912               | 128    | 0.52                               | 0.15                                | 0.10  | 0.06   | 0.04           | 0.50                                                    |
| $F$ -statistic                         |                      |                                     |                   |        | 5.72                               | 1.19                                | 2.24  | 13.10  | 0.97           | 1.24                                                    |
| $p$ -value                             |                      |                                     |                   |        | 0.00                               | 0.31                                | 0.05  | 0.00   | 0.44           | 0.29                                                    |

firms reduce their dependence on banks too. The fraction of borrowing from banks declines from 63 percent for firms aged 10 to 19 years to 52 percent for the oldest firms in our sample (see Table II, Panel B). This seems to suggest that firms follow a “pecking order” of borrowing over time, starting with the closest sources (family) and then progressing to more arm’s length sources.<sup>8</sup> The fraction of institutional loans from close institutions is also consistent with this observation. Except for the first group, which contains firms which are larger than average, loans from close institutions decrease as the firm gets older, from 0.60 to 0.50.<sup>9</sup>

### *C. Concentration of Borrowing*

Another measure of the closeness of a borrower to its lenders is the concentration of the firm’s borrowing across lenders. Table III, Panel A describes the average fraction of total firm borrowing that comes from the largest single lender when firms are grouped by size. The smallest 10 percent of firms who have a bank as their largest single lender secure, on average, 95 percent of their loans (by value) from it. By contrast, the largest 10 percent of firms obtain 76 percent of their loans from the bank. Thus, firms tend to concentrate their borrowing from one source, though this concentration decreases as firm size increases. As the table shows, such concentrated borrowing is not restricted to firms that have a bank as their largest lender. The same pattern appears no matter what the identity of the largest lender. Another way of measuring concentration is the number of sources from which a firm borrows. On average, the smallest firms tend to have just over one lender while the largest firms have about three lenders (numbers not in table).

Table III, Panel B describes the average fraction of total firm borrowing that comes from the largest single lender when firms are grouped by age. The high concentration of borrowing is still apparent in this table, but there is little variation with age. When the largest single lender is a bank, there is a slight decrease in dependency as firms age. In summary, the data show that small firm borrowing is highly concentrated. Firms diversify their sources as they become larger. It is less clear that age has any effect on diversification. Concentration of borrowing could be one measure of how close a firm is to its main lender. We will shortly describe other measures of closeness and their effect on the cost and availability of capital.

<sup>8</sup>The youngest 10 percent of firms in our sample borrow an amount equal to 0.32 of their book assets, while the oldest 10 percent of firms in our sample borrow only 0.15. The smallest 10 percent of firms in our sample borrow 0.22 of their book assets while the largest 10 percent of firms in our sample borrow 0.30 of their book assets. Thus, leverage decreases with age, but increases with size. A natural explanation for this is that young firms are externally financed while old firms finance via retained earnings. Larger firms may also be firms that have grown faster and have thus borrowed more.

<sup>9</sup>A regression shows that the fraction borrowed from close institutions is positively related to size and negatively related to the age of the firm. Both coefficients are statistically significant at the 5 percent level.

**Table III**  
**Concentration of Borrowing: By Size and Age**

The results are reported by firm size, firm age, and primary source of debt. The asset percentiles are based on the entire sample and are the same as the ones used in Table II, Panel A. The first row contains information on the smallest 10 percent of the firms. The fraction of total borrowing from the largest single lender is reported by type of largest lender. The number of firms in each cell are reported in parentheses. The *F*-statistic tests the hypothesis that the percentage of borrowing from the largest lender is constant across the different size categories.

| Panel A: Concentration of Borrowing by Size |                      |                                           |                                     |           |           |                |
|---------------------------------------------|----------------------|-------------------------------------------|-------------------------------------|-----------|-----------|----------------|
| Book value of Asset<br>(\$1,000)            | Asset<br>Percentiles | Fraction of Borrowing from Largest Lender |                                     |           |           |                |
|                                             |                      | Bank                                      | Nonbank<br>Financial<br>Institution | Owner     | Family    | Other<br>Firms |
| Less than 15                                | 0–10                 | 0.95 (51)                                 | 0.93 (10)                           | 0.97 (12) | 0.93 (14) | 0.79 (5)       |
| 15–46                                       | 10–25                | 0.93 (153)                                | 0.88 (31)                           | 0.92 (32) | 0.90 (26) | 0.88 (9)       |
| 46–130                                      | 25–50                | 0.88 (359)                                | 0.81 (62)                           | 0.87 (52) | 0.84 (65) | 0.87 (17)      |
| 130–488                                     | 50–75                | 0.84 (390)                                | 0.79 (72)                           | 0.74 (81) | 0.81 (65) | 0.85 (26)      |
| 488–2,293                                   | 75–90                | 0.79 (296)                                | 0.74 (49)                           | 0.73 (38) | 0.81 (23) | 0.73 (15)      |
| Over 2,293                                  | 90–100               | 0.76 (211)                                | 0.72 (43)                           | 0.75 (18) | 0.74 (7)  | 0.71 (9)       |
| <i>F</i> -statistic                         |                      | 19.98                                     | 2.61                                | 6.16      | 1.79      | 1.44           |
| <i>p</i> -value                             |                      | 0.00                                      | 0.03                                | 0.00      | 0.12      | 0.22           |

| Panel B: Concentration of Borrowing by Age |        |            |           |           |           |           |
|--------------------------------------------|--------|------------|-----------|-----------|-----------|-----------|
| Less than 2                                | 0–10   | 0.86 (150) | 0.80 (25) | 0.85 (25) | 0.89 (51) | 0.76 (16) |
| 2–5                                        | 10–25  | 0.85 (219) | 0.77 (43) | 0.82 (52) | 0.83 (44) | 0.86 (10) |
| 5–10                                       | 25–50  | 0.85 (347) | 0.76 (58) | 0.81 (53) | 0.83 (54) | 0.84 (24) |
| 10–19                                      | 50–75  | 0.85 (426) | 0.80 (71) | 0.80 (50) | 0.78 (30) | 0.88 (15) |
| 19–30                                      | 75–90  | 0.82 (216) | 0.84 (42) | 0.73 (34) | 0.77 (12) | 0.70 (10) |
| Over 30                                    | 90–100 | 0.80 (106) | 0.78 (28) | 0.83 (19) | 0.97 (9)  | 0.83 (6)  |
| <i>F</i> -statistic                        |        | 1.51       | 0.62      | 0.96      | 2.10      | 1.25      |
| <i>p</i> -value                            |        | 0.18       | 0.68      | 0.44      | 0.07      | 0.29      |

### III. The Cost of Capital

#### A. Description of Loan Rates

In this section we examine the effect of relations on the firm's cost of debt. The data set includes the interest rate on the firm's most recent loan for 1,389 firms. The source of the loan is from institutions—a bank, a nonbank financial firm, or a nonfinancial firm—so that loans from the owner or her family are not included in this subsample. Banks are the dominant source of external capital, accounting for 82 percent of the loans in this sample. The interest rates average 11.3 percent with a standard deviation of 2.2 percent. This is 4.1 percent above the rate on a government bond of similar maturity, 2.4 percent above the prime rate at the time the loans were made, and 13 basis points below the yield on BAA corporate bonds (a basis point is one hundredth of a percentage point).

*B. Determinants of the Loan Rate*

Before we turn to the role of relationships, it is important that we control for the underlying cost of capital as well as loan- and firm-specific characteristics that influence the rate. In the regression results below, we use the prime rate to control for changes in the underlying cost of capital. The prime rate includes the risk-free rate and a default premium for the bank's best customers. If these small businesses are not the bank's best customers, they will pay an additional default premium. We control for aggregate variations in this premium by including the difference between the yield on corporate

**Table IV**  
**Borrowing Costs and the Role of Relationships**

The dependent variable is the interest rate quoted on the firm's most recent loan. Standard errors are reported in parentheses. In addition to the variables reported, each regression also includes seven industry dummies based on the one-digit SIC codes, three regional dummies, six dummy variables for the type of assets with which the loan is collateralized, and an intercept.

| Variable                                                                          | (1)       | (2)       | (3)      | (4)       |
|-----------------------------------------------------------------------------------|-----------|-----------|----------|-----------|
| <i>Interest rate variables</i>                                                    |           |           |          |           |
| Prime rate                                                                        | 0.278*    | 0.282*    | 0.312*   | 0.278*    |
|                                                                                   | (0.030)   | (0.030)   | (0.035)  | (0.030)   |
| Term structure spread                                                             | -0.019    | -0.017    | 0.000    | -0.027    |
|                                                                                   | (0.083)   | (0.083)   | (0.100)  | (0.083)   |
| Default spread                                                                    | 0.333**   | 0.340**   | 0.183    | 0.325**   |
|                                                                                   | (0.149)   | (0.149)   | (0.175)  | (0.149)   |
| <i>Firm characteristics</i>                                                       |           |           |          |           |
| Log(book value of assets)                                                         | -0.254*   | -0.264*   | -0.255*  | -0.259*   |
|                                                                                   | (0.045)   | (0.044)   | (0.056)  | (0.045)   |
| Debt book assets                                                                  | 0.005     | -0.015    | -0.051   | 0.001     |
|                                                                                   | (0.143)   | (0.143)   | (0.159)  | (0.143)   |
| Borrower is a corporation (0, 1)                                                  | -0.238*** | -0.229*** | -0.257   | -0.243*** |
|                                                                                   | (0.139)   | (0.139)   | (0.169)  | (0.140)   |
| Sales growth (1986-87) <sup>a</sup>                                               |           |           | -0.585*  |           |
|                                                                                   |           |           | (0.301)  |           |
| Profits/interest <sup>a</sup>                                                     |           |           | -0.010*  |           |
|                                                                                   |           |           | (0.006)  |           |
| Mean 1987 gross profits/assets ratio<br>in two-digit SIC industry                 |           |           |          | 1.391**   |
|                                                                                   |           |           |          | (0.700)   |
| Mean $\sigma$ (gross profits/assets) between 1983-87<br>in two-digit SIC industry |           |           |          | -0.771    |
|                                                                                   |           |           |          | (0.681)   |
| <i>Loan characteristics</i>                                                       |           |           |          |           |
| Floating rate loan (0,1)                                                          | -0.463**  | -0.448**  | -0.469** | -0.473*   |
|                                                                                   | (0.181)   | (0.181)   | (0.222)  | (0.182)   |
| Bank loan (0, 1)                                                                  | 0.238     | 0.216     | 0.341    | 0.248     |
|                                                                                   | (0.225)   | (0.225)   | (0.270)  | (0.225)   |
| Nonfinancial firm loan firm (0, 1)                                                | -1.125*   | -1.178*   | -0.513   | -1.138*   |
|                                                                                   | (0.360)   | (0.361)   | (0.430)  | (0.360)   |

Table IV—Continued

| Variable                                                    | (1)                 | (2)                | (3)                  | (4)                 |
|-------------------------------------------------------------|---------------------|--------------------|----------------------|---------------------|
| <i>Relationship Characteristics</i>                         |                     |                    |                      |                     |
| Length of relationship (in years) <sup>b</sup>              | 0.002<br>(0.006)    | 0.081<br>(0.059)   | 0.003<br>(0.007)     | 0.002<br>(0.006)    |
| Firm age (in years) <sup>b</sup>                            | −0.014**<br>(0.006) | −0.227*<br>(0.078) | −0.011***<br>(0.007) | −0.014**<br>(0.006) |
| Information financial service (0, 1)                        | −0.089<br>(0.159)   | −0.087<br>(0.158)  | 0.057<br>(0.185)     | −0.087<br>(0.159)   |
| Noninformation financial service (0, 1)                     | −0.097<br>(0.153)   | −0.101<br>(0.153)  | −0.134<br>(0.181)    | −0.104<br>(0.153)   |
| Deposit accounts with current lender (0, 1)                 | 0.064<br>(0.182)    | 0.008<br>(0.186)   | −0.041<br>(0.225)    | 0.061<br>(0.182)    |
| Number of banks from which firm borrows                     | 0.306*<br>(0.085)   | 0.321*<br>(0.085)  | 0.303*<br>(0.096)    | 0.302*<br>(0.085)   |
| Herfindahl index for financial institutions<br>(1, 2, or 3) | 0.042<br>(0.077)    | 0.033<br>(0.077)   | −0.024<br>(0.091)    | 0.033<br>(0.077)    |
| Number of observations                                      | 1,389               | 1,389              | 978                  | 1,389               |
| Adjusted $R^2$                                              | 0.145               | 0.146              | 0.158                | 0.146               |
| Root mean squared error                                     | 2.18                | 2.18               | 2.16                 | 2.18                |

<sup>a</sup> When profits are negative, “Profits/interest” was coded as zero. Both “Profits/interest” and “Sales growth” are truncated at their 95th percentiles (76.0 and 1.0) to limit the influence of outliers.

<sup>b</sup> We replace length of relationship and firm age by the natural log of one plus the length of relationship and firm age in column 2. Thus the coefficient measures the change in the interest rate due to a one percent increase in the independent variable.

\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\*\*\* Significant at the 10 percent level.

bonds rated BAA and the yield on ten-year government bonds.<sup>10</sup> We also include a term premium, defined as the yield on a government bond of the same maturity as the loan minus the Treasury bill yield, to account for interest rate differences across different loan maturities. For floating rate loans this variable is set to zero. We estimate an ordinary least squares regression of the form:

$$\begin{aligned}
 &\text{Interest rate on most recent loan} \\
 &= \beta_0 + \beta_1 \text{ Economy wide interest rate variables} \\
 &\quad + \beta_2 \text{ Firm characteristics} + \beta_3 \text{ Loan and lender characteristics} \\
 &\quad + \beta_4 \text{ Region and industry dummies} \\
 &\quad + \beta_5 \text{ Relationship characteristics} + \varepsilon.
 \end{aligned} \tag{1}$$

The regression that explains the variation in the rate quoted on the most recent loan is reported in Table IV, column 1. A significant fraction of the rate

<sup>10</sup> We obtain the yields on government bonds from the CRSP Fama-Bliss Bond Files. We obtain the yield on BAA corporate bonds from the Citibase database.

variation is explained by economy-wide factors. The change in the loan rate due to a change in the market rate is, however, significantly less than one. A one percent increase in the prime rate raises the loan rate by 28 basis points. The relative insensitivity of the loan rate is consistent with evidence from markets for consumer borrowing (see Ausubel (1992)). Increases in the default premium also raise the firm's borrowing rate. Each percentage increase in the spread between the BAA corporate rate and the long-term government bond rate raises the average loan rate by 33 basis points.

To control for variation in the loan rate due to the characteristics of the firm we include the firm's size (book value of assets), leverage, dummies for the firm's industry (coefficients not reported), and whether the firm is incorporated. The coefficient estimates for the firm characteristics are consistent with these variables being proxies for risk. Larger firms pay lower interest rates. A firm with assets of \$740,000 (the 75th percentile) can expect to pay 0.59 percentage points less than a firm with assets of only \$72,000 (the 25th percentile). Being incorporated lowers the interest rate by an additional 24 basis points.

To control for variation in the loan rate due to the characteristics of the loan we include dummies for whether it is a floating rate loan, for the kind of collateral offered (coefficients not reported), and for the type of lender making the loan. We also include regional dummies, industry dummies (coefficients not reported), and a measure of the Herfindahl index of the concentration of depository institutions in the area where the firm is headquartered.

### *C. The Role of Relationships*

Based on the discussion in Section II, we expect relationships to lower the lender's cost of lending to small firms. We estimate the effect of relationships on the interest rate charged. Implicit, therefore, in our analysis is the assumption that reductions in the lender's cost are passed on to the borrower in a lower rate. The first dimension of a relationship that we include is the length of the relationship between the borrower and its current lender. This should be a proxy for the private information the institution has about the firm. Firms who have been doing business with their lender for a short time should pay a higher rate. Of course, we must distinguish this effect from the fact that younger firms pay higher rates on their loans (Dennis, Dunkelberg, and Van Hulle (1988)). The length of the relationship and the age of the firm are correlated but not as highly as expected ( $\rho = 0.41$ ). When both variables are included in the regression, we find little independent importance for the length of the relationship (see Table IV, column 1). The coefficient is positive, but its magnitude is statistically zero ( $\beta = 0.002$ ,  $t = 0.3$ ). Older firms, however, are charged statistically smaller interest rates; an additional year lowers the interest rate by 1.4 basis points or 0.014 percentage points ( $t = -2.3$ ).

The firm's reputation may not increase linearly with the age of the firm. The effect of an additional year of existence should decline with the age of the

firm. To test for a possible nonlinear relation, we first estimate a separate slope for the firm age variable when firm age is less than 10 years (the median age). The coefficient is slightly larger, but the larger standard error means the coefficient is not statistically different from zero. We next replace the firm age and the relationship age by the log of one plus the age. This allows the marginal impact of age to decline. The estimates are reported in Table IV, column 2. The coefficient on the length of the relationship is again not significantly different from zero, while the coefficient on firm age indicates a declining impact of age. An additional year reduces the interest rate by 16 basis points if the firm has just been founded or acquired (age = 0), but only 2 basis points if the firm is 10 years old. To see the economic importance of this coefficient, a one standard deviation increase in the log of one plus the age of the firm reduces the interest rate it is charged by 0.19 percentage points. Later, we will compare the economic impact of relationship proxies on the interest rate with their impact on the availability of credit. An admittedly crude comparison is to calibrate these effects against a common standard, i.e., the effect of an increase in firm size. A one standard deviation increase in the size of the firm reduces the interest rate by 0.47 percentage points. Thus the effect of firm age on the interest rate is only 40 percent as large as the effect of firm size on the interest rate.<sup>11</sup>

The  $R^2$  in columns 1 and 2 is almost identical, meaning that the data do not distinguish between a linear specification and a log linear specification. We also use the alternative definition of firm age as the number of years since the firm was founded rather than the number of years under current ownership. The coefficient on firm age drops by two thirds. The owner's reputation is apparently more important than that of the business.

The second measure we examine is the nonborrowing side of the firm's relationship with its current lender. In addition to borrowing, the firm may have checking or savings deposits with its current lender. Sixty-four percent of our sample does. The firm may also purchase financial services from the firm. As discussed earlier, these nonloan services can be used by the lender to monitor the firm. If these sources of information reduce monitoring costs or improve the accuracy of the lender's information, they should reduce the expected cost of such loans. We have already listed the financial services that might provide information to the lender (see Section II.B for a list of these services). In addition, the lender may perform services that arguably do not give it information—for example, providing change and night depository services. We code dummy variables for whether the firm had checking or savings deposits with the current lender, whether it purchased other informationally intensive financial services from it, and whether it purchased noninformational services.

<sup>11</sup> The figure of 40 percent is obtained by dividing the magnitude of the effect of a one standard deviation change in the log of one plus firm age on the interest rate (0.19 percent) by the effect of a one standard deviation change in firm size on the interest rate (0.47 percent).

That a firm obtains financial services from the current lender has no significant effect on the interest rate in our sample (see Table IV, column 1). Lenders who provide their customers with informationally intensive services charge a lower rate on their loans; however, the magnitude of this reduction is tiny (9 basis points). In addition, all three coefficients are statistically indistinguishable from zero.

Our third measure of the strength of the relationship is how concentrated the firm's borrowing is. From the results in Section II, it is clear that the firms in our sample borrow a significant fraction of their debt from a single institution. Even the largest firms in our sample borrow three quarters of their debt from a single institution (see Table III, Panel A). Firms may concentrate their borrowing with a lender to reduce overall monitoring costs, improve the lender's control, and cement their relationship. In these cases, concentrated borrowing should be associated with lower cost credit. Alternatively, firms may borrow from a single lender because it is their only source of credit. If so, then concentrated borrowing should be associated with more expensive credit.

We use the number of banks from which the firm borrows as a measure of borrowing concentration.<sup>12</sup> The firms in our sample borrow from no more than six banks, and the median firm borrows from only one bank. Eighteen percent of the firms borrow from more than one bank. We find that the rate paid by a firm increases by a significant 31 basis points when a firm increases the number of banks from which it borrows by one (Table IV, column 1). If we use the calibration method discussed earlier, the effect of the number of banks on the interest rate is about 53 percent of the effect of size.

As an alternative measure of concentration, we include the number of nonbank institutions from which the firm borrows. Increasing the number of nonbank institutions from which the firm borrows has no effect on the firm's borrowing rate. It is perhaps more plausible to think that ties between a firm and a bank are more indicative of a close relationship than ties between a firm and a nonbank. If so, this evidence suggests that the rate increases with a multiplicity of relationships rather than a multiplicity of creditors. In summary, a single banking relationship lowers borrowing costs, while multiple banking relationships are costly.

An alternative interpretation of the above result is that the number of banks is really a proxy for the firm's quality. Lower quality firms, unable to borrow additional money from their first bank, must approach other banks for additional capital. If so, the unwillingness of the original bank to extend the firm additional credit may be a signal of the firm's riskiness or quality, and the firm can obtain credit at a second bank only at a higher rate. In discussions with small business bankers, we were told there are several reasons besides quality why a firm may have multiple banks. Some banks specialize in the type of loans they make. Thus, a firm whose management wants to borrow with a line of credit against its accounts receivable may have

<sup>12</sup> We also consider the fraction of the firm's debt that is borrowed from its current lender. The results are qualitatively identical.

to approach a different bank than the one that made it a mortgage loan. Some firms borrow from multiple banks, so they can play the banks off against each other. Finally, some owners like the prestige of multiple banking relationships. To test the quality hypothesis, we divide the sample into those firms that have one bank and those that have more than one bank. We then search for differences between the two samples.

The firms with multiple banks are over twice as large as those with only one bank. As firms grow, they expand the number of banks from which they borrow. But these are not necessarily firms which are in the process of expanding (over) aggressively. The firms with multiple banks have lower sales growth (16 percent versus 35 percent).<sup>13</sup> They also have lower interest coverage (median profits/interest of 2.2 versus 4.3). These numbers suggest that the number of banks may be a proxy for lower quality firms. To test this hypothesis we include interest coverage and sales growth as additional explanatory variables in the interest rate regression (see Table IV, column 3). Both variables help predict the interest rate, and both are marginally statistically significant.<sup>14</sup> But the coefficient for the number of banks is only marginally lower than that in column 1. This suggests that the number of banks is not strictly a proxy for quality.

Finally, it is possible that since the data come from a survey of small businesses, many of which may not be audited, the profit figure is uninformative. While we do not have access to the names of the firms and cannot obtain more data on them, we know the two-digit Standard Industrial Classification (SIC) industry code for each firm. From COMPUSTAT, we extract the average gross-profits-to-asset ratio in 1987 for each firm's industry. We also calculate the standard deviation of the gross-profits-to-assets ratio between 1983 and 1987 for each COMPUSTAT-listed firm and obtain the average for the two-digit industry.<sup>15</sup> The first is a measure of profitability, and credit quality should increase with it. The second is a measure of risk, and credit quality should decrease with this variable. We report the results in column 4 of Table IV. The coefficients have the opposite sign to that expected. The interest rate is increasing in the average profitability and declining in the variability of profitability. Only the first coefficient is significantly different from zero.<sup>16</sup>

<sup>13</sup> For most variables the survey includes financial data only for 1987. It does, however, include sales figures for both 1986 and 1987. We use these numbers to calculate the firm's sales growth.

<sup>14</sup> Interest rate coverage will depend in part on the interest rate of the current loan. This endogeneity will bias the coefficient downward. Thus our estimated coefficient is probably more negative than the true coefficient.

<sup>15</sup> We only consider COMPUSTAT firms with book value of assets in 1987 below \$150 million. We consider lead and lagged average profits, but these do not enter significantly.

<sup>16</sup> We examine this further by dropping loans where the interest rate was below the government bond rate. Presumably, these loans are made as part of a broader set of transactions and may not represent the true (relationship-adjusted) cost. The coefficients on average industry profits and standard deviation of industry profits reverse and have the expected sign, suggesting that loans to some poor quality firms—with low industry profits and high industry standard deviation of profits—are made at rates below the risk-free rate. Petersen and Rajan (1993) explore this issue in greater detail.

Not all of our proxies for the strength of firm-lender relationships are correlated with cheaper credit. That these variables do not all have a significant effect on the observed interest rate is consistent with three different theoretical explanations and an econometric one. The simplest one is that relationships do not matter much because all information is public or, at least, easily verifiable. If any potential lender can evaluate a loan's risk as accurately (and at the same cost) as the relationship lender there is no value to a specific relationship. A second possibility is that relationships do indeed have value, but rationed firms prefer greater availability of funds to a reduction in price. A third possibility is that the lender is not compelled by market forces to pass on the benefits via a lower interest rate. If the relationship confers a monopoly on the lender, this is what we would expect. The econometric explanation is that our measures may not capture the existence or strength of relationships.

#### **IV. The Availability of Credit**

##### *A. How to Measure the Availability of Credit*

We now estimate the effect of relationships on the availability of credit. If our proxies for relationships predict the availability of credit, then the econometric problem discussed above does not explain our interest rate regression. Furthermore, we may be able to distinguish among the theoretical explanations. Unfortunately, it is difficult to measure credit availability directly. The firm's debt ratio will underestimate the credit available to the firm—firms may have low debt ratios because the firm is liquidity constrained (a supply constraint) or because they have little need for external capital (a demand constraint).

The firm's debt ratio is simultaneously determined by the firm's demand for credit and the supply of credit from institutions. Thus regressions that use the firm's debt ratio as the dependent variable will suffer from a simultaneous equations bias. Changes in the debt ratio can be due to changes in demand for credit (the supply curve is observed) or by changes in supply of credit (the demand curve is observed). This statistical problem is apparent when we regress a firm's debt-to-asset ratio on characteristics of the firm. The results are reported in Table V. The dependent variable is total debt divided by assets. Credit availability should be greater for higher quality firms. Consistent with this intuition, large firms and firms in industries with high average earnings and low earnings volatility tend to have a high debt-to-assets ratio. However older firms and more profitable firms—which should be higher quality—have lower, not higher, debt ratios. The problem is we cannot tell whether older firms are rationed by creditors (a supply effect) or whether they have a lower demand for external credit. Since the coefficient estimates from this regression are not unbiased, we propose an alternative measure of the credit available to the firm.

**Table V**  
**Determinants of the Firm's Debt Ratio**

The dependent variable is total debt divided by the book value of assets. It has been multiplied by 100. Since the debt ratio is censored at zero we estimate the coefficients using a one-sided tobit model. Asymptotic standard errors are reported in parentheses. The regression also includes seven industry dummies based on the one-digit SIC codes.

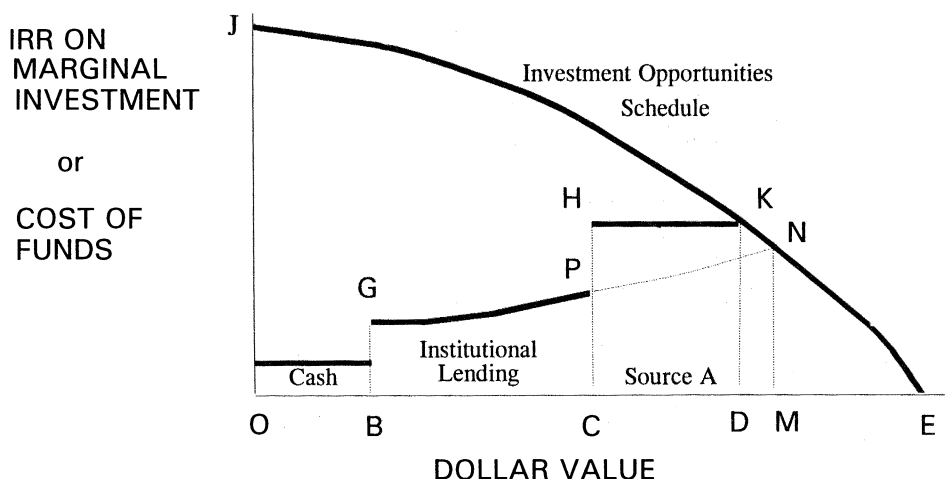
| Variable                                                                          |                   |
|-----------------------------------------------------------------------------------|-------------------|
| Log(book value of assets)                                                         | 4.40*<br>(0.56)   |
| Profits/assets (%)                                                                | -0.99*<br>(0.38)  |
| Borrower is a corporation (0, 1)                                                  | 9.32*<br>(1.99)   |
| Firm age (in years)                                                               | -0.80*<br>(0.09)  |
| Length of longest relationship<br>(in years)                                      | -0.19**<br>(0.08) |
| Herfindahl index for bank deposits                                                | 3.57*<br>(1.33)   |
| Mean 1987 gross profits/assets ratio<br>in two-digit SIC industry                 | 19.34**<br>(8.92) |
| Mean $\sigma$ (Gross profits/assets) between 1983-87<br>in two-digit SIC industry | -11.94<br>(9.48)  |
| Number of observations                                                            | 3,233             |
| $\chi^2$<br>( <i>p</i> -value)                                                    | 347.1<br>(0.000)  |

\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

If institutions limit the credit extended to a firm, the firm will borrow from more expensive sources, so long as the returns from its investments exceed the cost of funds from those sources. Firms with unlimited access to institutional credit will never turn to the more expensive source. Therefore, with certain caveats discussed below, the amount borrowed from more expensive sources should measure the degree to which firms are supply constrained by institutions. More specifically, let the firm's rate of return on the marginal dollar invested be given by curve *JKE* in Figure 1. The firm should invest until the rate of return from the marginal dollar of investment equals the opportunity cost of capital. The firm has three sources of capital: internally generated cash flow (*OB*), borrowing from institutions (*BC*), and borrowing from an alternative source (*CD*).

The firm will exhaust its cheapest source, internal cash, before approaching the financial institutions. If institutions do not ration credit, the firm will invest to the point where the (increasing) marginal cost of borrowing from institutions (represented by curve *GN*) intersects the curve *JKE*. The firm will invest *OM*. If, however, institutions ration the amount of credit they offer the firm, say to amount *BC*, the firm only invests *OD*. Holding all else equal,



**Figure 1. Sources and uses of funds.** The solid curve *JKE* represents the Internal Rate of Return (*IRR*) on the marginal investment. *GP* is the marginal cost of institutional credit offered, while *HK* is the marginal cost of borrowing from *Source A*. *OB* is the amount of cash the firm has, *BC* is the amount borrowed from institutional lenders, and *CD* is the amount borrowed from *Source A*. *OD* is the total amount invested.

the amount *CD* that the firm borrows from the alternative source is then an inverse measure of the quantity of credit available from institutions. For *CD* to be an appropriate measure of institutional credit rationing, the marginal cost of borrowing from the alternative source must exceed the marginal cost of available institutional credit. If this is not true, the amount *CD* will be a function of the price financial institutions charge, as opposed to the volume of credit they are willing to offer. Also, the cost of borrowing from the alternative source should be relatively similar for firms within an identifiable class. Otherwise the amount *CD* will be a function of the specific firm's cost of borrowing from the alternative source.

What could the expensive source of credit be? Most of the firms in our sample are offered trade credit—short-term financing, which some suppliers provide with their goods and services.<sup>17</sup> We have data on the percentage of a firm's purchases that are made on credit, the percentage of this credit that is accompanied by discounts for early payment, the percentage of the discounts that are taken, and the percentage of trade credit that is paid late. In general, discounts for early payment and the penalties for late payment are substantial. They are meant to encourage the firm to pay on time. For

<sup>17</sup>Clearly, the trade creditor realizes a margin on the goods sold which is why she may be prepared to offer credit tied to the purchase of the goods even when others ration credit. Mian and Smith (1992) offer a variety of other reasons why trade creditors may do this. The manufacturer may find the collateral (merchandise) more valuable and easier to sell after repossession. Also, she may have a cost advantage in credit evaluation. Trade credit may be a method of price discrimination. Finally, there may be tax advantages if the financing qualifies as an installment loan. None of this suggests that trade credit is a cheap source of finance.

example, some firms in the retail business face the terms 10–2–30 (Smith (1987)). This is a discount of 2 percent if paid within 10 days (the “discount” date) and the full amount if paid in 30 days (the “due” date). Foregoing the 2 percent discount is equivalent to borrowing at an annual rate of 44.6 percent.<sup>18</sup>

Clearly, the annualized rate is not that high if firms are allowed to stretch repayments beyond the due date. Since the stated terms in an industry may differ from actual industry practice, we use our data to construct empirical measures of the actual stretch that firms face. Based on each firm’s stock of accounts payable, we construct the days payable outstanding (DPO) for each firm, which is defined as 365 times the firm’s accounts payable over its cost of goods sold. We report the DPO by industry in Table VI.<sup>19</sup> To estimate the potential stretch available to trade credit borrowers, we calculate the difference in the DPO between firms that regularly take the early payment discounts and those that do not. For each industry, we determine the median DPO for firms that take less than 10 percent of the discounts they are offered and the median DPO for firms that take more than 90 percent of the discounts offered. The difference between these two numbers is reported as the “Discount Stretch” in Table VI, and it is an estimate of how long firms that do not take discounts stretch their credit. For the retail industry it is 8.9 days.<sup>20</sup> Based on the standard terms, firms that do not take the discount are paying an additional 2 percent for 8.9 days of credit, which translates to an annualized interest rate of 129 percent.

A second way in which the firm can extend its trade credit financing is by paying late, i.e., after the due date. Clearly, the firm will incur both reputational and pecuniary penalties for paying late. For example, among gasoline wholesalers margins are so thin that a firm paying late may be forced to pay cash for future purchases and may be cut off from future supplies.<sup>21</sup> For each industry, we estimate the “Late Payment Stretch” as the difference between the median DPO for firms that repay more than 50 percent of their trade credit late and the median DPO for firms that repay less than 10 percent of their trade credit late. We find it to be 16.9 for the retail industry. Thus if the firm does not take the discount by paying on the tenth day and stretches the

<sup>18</sup> By taking the early payment discount, the firm is borrowing at  $2/98$  or 2.04 percent per 20-day period. Since there are  $365/20$  or 18.25 such periods in a year, this is equivalent to an annual rate of 44.6 percent ( $[1 + 2/98]^{(365/20)} - 1$ ).

<sup>19</sup> We used two classifications for industry—the two-digit SIC code and the one-digit SIC code. We report only the broader classification in Table VI but use the two-digit SIC code in the estimates reported in Tables VII, VIII, and IX.

<sup>20</sup> Why is this number so low compared to the 20 days that should be the case if the discount terms are 2–10–30? A possible reason is that the discount date is not strictly enforced while the due date is, so that firms get discounts even if they pay after the tenth day (see Dun and Bradstreet (1970)). Another possible reason is that firms stretch entirely on the portion offered with discounts and not on any of the trade credit offered with net terms. If this is true (and we have no reason to believe that the firm should not stretch trade credit offered on net terms also), the stretch goes up to  $8.9/0.3 = 30$  days. This is an implicit interest rate of 27.9 percent, which is still higher than the highest interest rate on institutional loans in our sample (24.5 percent).

<sup>21</sup> Authors discussions with Mr. Chuck Patton, Credit Department, Amoco Oil Company.

Table VI  
**Days Payable Outstanding and Stretch by Industry**

Days Payable Outstanding = 365 \* Firm's Accounts Payable/Costs of Goods Sold. "Discount Stretch" is defined as the difference within the one-digit SIC industry between the median days payable outstanding for firms that take fewer than 10 percent of their early payment discounts and the median DPO for firms that take more than 90 percent of their early payment discounts. "Late Payment Stretch" is defined as the difference within the industry between the median days payable outstanding between firms that pay more than 50 percent of trade credit late and firms that pay less than 10 percent of their trade credit late. Due to the small number of observations in the utilities and transportation industry, we are not able to calculate the Discount Stretch or the Late Payment Stretch.

| Industry                     | Number<br>of Firms | Days Payable Outstanding |       |         | Fraction of Firms<br>Taking $\geq 90\%$ of<br>Early Payments | Discount<br>Stretch<br>(in Days) | Fraction of<br>Firms Paying<br>$\geq 50\%$ of Trade<br>Credit Late | Late Payment<br>Stretch<br>(in Days) |
|------------------------------|--------------------|--------------------------|-------|---------|--------------------------------------------------------------|----------------------------------|--------------------------------------------------------------------|--------------------------------------|
|                              |                    | Median                   | Mean  | Std Dev |                                                              |                                  |                                                                    |                                      |
| Mining                       | 20                 | 30.6                     | 43.7  | 50.8    | 21.4                                                         | 62.0                             | 23.1                                                               | 60.4                                 |
| Construction                 | 355                | 15.9                     | 37.5  | 96.6    | 62.5                                                         | 22.7                             | 22.5                                                               | 21.0                                 |
| Manufacturing                | 356                | 27.3                     | 43.8  | 83.3    | 42.3                                                         | 14.9                             | 24.6                                                               | 18.4                                 |
| Utilities and transportation | 5                  | 9.4                      | 18.5  | 20.6    | 66.6                                                         | —                                | 0.0                                                                | —                                    |
| Wholesale trade              | 296                | 19.7                     | 37.2  | 84.6    | 60.4                                                         | 19.9                             | 19.8                                                               | 13.6                                 |
| Retail trade                 | 825                | 10.8                     | 25.2  | 60.9    | 57.6                                                         | 8.9                              | 12.8                                                               | 16.8                                 |
| Insurance and real estate    | 69                 | 0.0                      | 207.2 | 1580    | 84.0                                                         | 1.2                              | 15.0                                                               | 96.7                                 |
| Services                     | 60                 | 4.7                      | 16.5  | 26.3    | 56.7                                                         | 16.5                             | 12.0                                                               | 0.0                                  |

payment out for 36.9 days (20 days plus the late payment stretch of 16.9), the implicit annual interest rate is 22.1 percent.<sup>22</sup> This is an underestimate of the true borrowing rate because it overstates the actual discount stretch that we estimate for the retail industry (8.9 days). It also underestimates the true borrowing cost because it ignores the reputational and pecuniary costs that missing the due date will impose on the firm. Despite these omissions, this interest rate is higher than 99.8 percent of the loans in our sample.

As a final way to document the true costs of financing a firm through delayed payment of its trade credit obligations, we calculate the percent of firms in an industry that take most of the early payment discounts (more than 90 percent) and the percent of firms that pay a significant fraction of their trade credits late (more than 50 percent). These numbers are reported in Table VI. That 58 percent of firms in the retail industry avail themselves of 90 percent or more of the discounts they are offered suggests that discounts are sizeable, and that firms that forego them are not getting cheap financing. Similarly, only 13 percent of firms pay more than 50 percent of their trade credits late, suggesting that the penalties for late payment are substantial. Furthermore, our conversations and previous work (Dun and Bradstreet (1970), Elliehausen and Wolken (1992)) indicate that discount terms are not specific to a firm, but are common practice throughout an industry. As these discounts and penalties are substantial and are industry specific and not firm specific, the fraction of trade discounts not taken or the fraction of trade credit paid late are good proxies for the amount *CD*.

### *B. Trade Credit Data*

In Table VII we present summary statistics for the data on trade credit. Larger (Table VII, Panel A) and older (Table VII, Panel B) firms make more of their purchases on credit, suggesting that the decision to offer credit seems to be firm specific. The percentage of credit offered with discounts for prompt payment, however, is invariant to firm characteristics like size and age. We test whether this percentage varies across age or size categories in Table VII. We cannot reject the hypothesis of a constant mean in either case ( $p = 0.93$  for size and 0.63 for age). We also regress the percentage of discounts offered on several firm characteristics and 12 industry dummies. Only the industry dummies are statistically significant. It appears that once the decision to offer credit is made, discounts for early payment automatically follow if it is the supplier's policy. This evidence also seems to indicate that the size of the

<sup>22</sup> Neither measure of stretch is completely accurate. The discount stretch has the problems discussed in footnote 20, while the late payment stretch overestimates the stretch from the due date because it does not take into account the possibility that early payers may take substantially more of their discounts. Yet another measure of the stretch could be the difference in medians between those taking 90 percent of their discounts and those paying more than 50 percent late. In the retail industry, this is 19.4 days, which translates to a 46.2 percent annual rate.

Table VII  
Trade Credit Usage of Firms: By Size and Age

Firms are grouped by size in Panel A and by age in Panel B. The number of firms in each cell are reported in parentheses. The *F*-statistic tests the hypothesis that the mean percentage is constant across the different size and age categories.

| Panel A: Trade Credit Usage of Firms: By Size |                   |                                        |  |                                                         |  |                                               |  |                                   |  |                                                                              |                                                                |
|-----------------------------------------------|-------------------|----------------------------------------|--|---------------------------------------------------------|--|-----------------------------------------------|--|-----------------------------------|--|------------------------------------------------------------------------------|----------------------------------------------------------------|
| Book Value of Assets (\$1,000)                | Asset Percentiles | Percentage of Purchases Made on Credit |  | Percentage of Trade Credit with Early Payment Discounts |  | Percentage of Offered Discounts Taken by Firm |  | Trade Credit Paid Late in Percent |  | Median Stretch for Firms (Measured from Last Day for Discounts) <sup>a</sup> | Median Stretch for Firms (Measured from Due Date) <sup>b</sup> |
|                                               |                   |                                        |  |                                                         |  |                                               |  |                                   |  |                                                                              |                                                                |
| Less than 15                                  | 0-10              | 71.8 (203)                             |  | 33.2 (204)                                              |  | 74.2 (122)                                    |  | 18.0 (100)                        |  | -13.03 (108)                                                                 | -17.91 (102)                                                   |
| 15-46                                         | 10-25             | 73.3 (366)                             |  | 31.4 (364)                                              |  | 64.4 (245)                                    |  | 21.2 (194)                        |  | -7.32 (245)                                                                  | -10.71 (239)                                                   |
| 46-130                                        | 25-50             | 74.0 (639)                             |  | 32.7 (632)                                              |  | 63.8 (457)                                    |  | 19.8 (344)                        |  | -2.60 (445)                                                                  | -5.86 (439)                                                    |
| 130-488                                       | 50-75             | 81.2 (694)                             |  | 32.8 (686)                                              |  | 64.9 (539)                                    |  | 21.7 (379)                        |  | 1.44 (473)                                                                   | -0.81 (464)                                                    |
| 488-2293                                      | 75-90             | 84.8 (446)                             |  | 31.5 (433)                                              |  | 68.3 (375)                                    |  | 21.4 (260)                        |  | 6.59 (305)                                                                   | 3.75 (308)                                                     |
| Over 2293                                     | 90-100            | 90.2 (298)                             |  | 34.1 (289)                                              |  | 70.5 (278)                                    |  | 21.0 (172)                        |  | 5.27 (214)                                                                   | 2.85 (210)                                                     |
| <i>F</i> -statistic                           |                   | 25.65                                  |  | 0.27                                                    |  | 2.17                                          |  | 0.56                              |  |                                                                              |                                                                |
| <i>p</i> -value                               |                   | 0.00                                   |  | 0.93                                                    |  | 0.05                                          |  | 0.73                              |  |                                                                              |                                                                |
| Panel B: Trade Credit Usage of Firms: By Age  |                   |                                        |  |                                                         |  |                                               |  |                                   |  |                                                                              |                                                                |
| Firms Age (Years)                             | Age Percentile    | Percentage of Purchases Made on Credit |  | Percentage of Trade Credit with Early Payment Discounts |  | Percentage of Offered Discounts Taken by Firm |  | Trade Credit Paid Late in Percent |  | Median Stretch for Firms (Measured from Last Day for Discounts) <sup>a</sup> | Median Stretch for Firms (Measured from Due Date) <sup>b</sup> |
|                                               |                   |                                        |  |                                                         |  |                                               |  |                                   |  |                                                                              |                                                                |
| Less than 2                                   | 0-10              | 75.4 (299)                             |  | 33.6 (295)                                              |  | 58.9 (224)                                    |  | 25.1 (155)                        |  | -2.20 (208)                                                                  | -5.86 (200)                                                    |
| 2-5                                           | 10-25             | 74.3 (414)                             |  | 32.2 (400)                                              |  | 57.1 (295)                                    |  | 23.7 (243)                        |  | 0.00 (282)                                                                   | -3.16 (276)                                                    |
| 5-10                                          | 25-50             | 79.2 (623)                             |  | 30.4 (615)                                              |  | 61.5 (457)                                    |  | 22.1 (357)                        |  | -0.02 (400)                                                                  | -2.97 (398)                                                    |
| 10-19                                         | 50-75             | 80.6 (689)                             |  | 33.3 (682)                                              |  | 68.9 (539)                                    |  | 18.4 (392)                        |  | 0.00 (470)                                                                   | -2.71 (473)                                                    |
| 19-30                                         | 75-90             | 82.7 (377)                             |  | 33.4 (376)                                              |  | 74.5 (308)                                    |  | 18.6 (210)                        |  | 2.89 (260)                                                                   | -1.22 (252)                                                    |
| Over 30                                       | 90-100            | 83.5 (244)                             |  | 34.1 (240)                                              |  | 82.4 (193)                                    |  | 15.8 (92)                         |  | 0.11 (170)                                                                   | -0.72 (163)                                                    |
| <i>F</i> -statistic                           |                   | 6.47                                   |  | 0.69                                                    |  | 14.89                                         |  | 4.09                              |  |                                                                              |                                                                |
| <i>p</i> -value                               |                   | 0.00                                   |  | 0.63                                                    |  | 0.00                                          |  | 0.00                              |  |                                                                              |                                                                |

<sup>a</sup> For each two-digit SIC industry, the median DPO is obtained for firms availing of more than 90 percent of their discounts. This is subtracted from the DPO for the firm to obtain the stretch as measured from the last day for discounts.

<sup>b</sup> For each two-digit SIC industry, the median DPO is obtained for firms paying less than 10 percent of credit late. This is subtracted from the DPO for the firm to obtain the stretch as measured from the due date.

discounts offered for early payment are unlikely to be tailored to the specific customer.

The two variables of interest are the percentage of trade credit that is paid after the due date (which we call late payments) and the percentage of discounts for early payment that are taken (which we call discounts taken). Both variables are taken from the survey. Each is a proxy for the amount borrowed from the alternative source. A firm that makes more late payments or takes fewer cash discounts uses a greater amount of trade credit as a source of financing. As seen in Table VII, these two variables do not seem to depend strongly on firm size, but do depend on age. Late payments decrease from 25.1 percent for the youngest firms to 15.8 percent for the oldest firms. Discounts taken increase from 58.9 percent for the lowest age category to 82.4 percent for the oldest firms.

### C. Test of the Effect of Relationships on Credit Availability

To determine if relationships increase the availability of credit, we regress late payments and discounts taken against measures of the firm's investment opportunities, its cash flow, its debt, and various measures of relationships. The regression is of the form:

$$\begin{aligned} &\text{Trade credits paid late} \\ &= \beta_0 + \beta_1 \text{ Measures of investment opportunities} \\ &\quad + \beta_2 \text{ Industry dummies} + \beta_3 \text{ Measures of cash flow} \\ &\quad + \beta_4 \text{ Measures of relationships} + \varepsilon. \end{aligned} \tag{2}$$

We include three measures of the firm's investment opportunities. Younger firms may have different investment opportunities than older firms. This may account for the pattern in Table VII, Panel B. Thus, firm age is one measure of investment opportunities. As discussed earlier, it is also a measure of the publicly available component of information. Investment opportunities could also depend on the firm's size (the book value of its assets). Finally, investment opportunities depend on the industry the firm is in, and thus industry dummies are included as explanatory variables. This will also control for differences in the price of trade credit financing across industries.

The firm's internal cash flow (normalized by book assets) is accounted for by including income after interest. While we do not have figures for depreciation, it ought to be a function of the firm's book assets which is already in the regression. We also include the ratio of outstanding institutional debt (i.e., total loans less family and owner loans) to book assets. This is a measure of the debt capacity the firm has already exhausted.<sup>23</sup> Finally we include a dummy for whether the firm is a corporation or not, because credit rationing

<sup>23</sup>An argument could be made for leaving debt out since if we perfectly control for investment opportunities, the level of trade credit used is an exact measure of the level of debt available. Leaving debt out of the regressions has no qualitative impact on the results.

should be greater for firms with limited liability. An owner-managed firm has a greater incentive to take on risky projects if it has limited liability.

We come now to the relationship variables. The first is the length of the longest relationship the firm has had with a financial institution. Second, we include a measure of how informed the firm's lenders are—this variable is the fraction of borrowing that comes from institutions that provide at least one significant financial service to the firm.<sup>24</sup> Third, we include a measure of how concentrated the firm's borrowing is—the number of institutions that account for more than 10 percent of the firm's borrowing. Finally, we include the Herfindahl index for financial institutions in the immediate area of the firm.<sup>25</sup> We cannot estimate our model with ordinary least squares since both dependent variables are expressed as percentages and are consequently censored at 0 or 100. The coefficients in a least squares estimate would be biased toward zero. We therefore estimate a tobit regression with two-sided limits.

#### *D. Findings*

The regressions explaining late payments are reported in Table VIII. The investment and cash flow variables have the predicted sign. Older and larger firms do not make as many late payments. More profitable firms do not make as many late payments, though this effect is not statistically significant.<sup>26</sup> Firms that have taken on more debt are more likely to pay late. Finally, corporations make more late payments. We now examine the relationship variables.

The length of the longest relationship with a financial institution is both economically and statistically significant regardless of whether we use a linear specification for firm age and relationship length (Table VIII, column 1) or a log specification (Table VIII, column 3). It is instructive to compare the economic magnitudes of the age and relationship coefficients estimated here with those estimated in the rate regression. A one standard deviation increase in the log of one plus the firm age reduces the percentage of trade credits paid late by 1.35. A one standard deviation increase in the log of one plus the length of the relationship reduces the percentage of trade credits paid late by 2.05. A one standard deviation increase in size reduces the percentage of trade credits paid late by 1.48. Following our crude method of calibration (see Section III.C), firm age has about 90 percent of the impact that firm size has on the availability of credit while it has only 40 percent of the impact that firm size has on the price of credit. More interesting,

<sup>24</sup> These are either deposit accounts or the informational financial services defined above.

<sup>25</sup> The survey does not report the actual Herfindahl index. We know whether the Herfindahl index is less than 0.10, between 0.10 and 0.18, or greater than 0.18. Our variable is therefore coded as 1, 2, or 3.

<sup>26</sup> Profits could proxy for a firm's cash flow which should reduce the amount paid late, but it could also proxy for the profitability of a firm's investment opportunities which would increase the amount paid late. The predicted effect is thus ambiguous.

**Table VIII**  
**Credit Availability and the Role of Relationships**  
**Dependent Variable: Trade Credits Repaid Late (%)**

The dependent variable is the percentage of trade credits that were paid after the due date (paid late). The coefficient estimates are from a tobit regression with two-sided censoring. The dependent variable is censored at 0.0 and 1.0. Asymptotic standard errors are in parentheses. Each regression also includes seven industry dummies based on the one-digit SIC codes.

| Independent Variable                                                              | (1)                  | (2)                  | (3)                 | (4)                 | (5)                  | (6)                  |
|-----------------------------------------------------------------------------------|----------------------|----------------------|---------------------|---------------------|----------------------|----------------------|
| Log(book value of assets)                                                         | -0.662<br>(0.490)    | -0.542<br>(0.495)    | -0.753<br>(0.486)   | -0.678<br>(0.513)   | -0.533<br>(0.489)    | -1.580*<br>(0.566)   |
| Profits/book assets                                                               | -0.679<br>(0.753)    | -0.785<br>(0.754)    | -0.663<br>(0.753)   | -0.643<br>(0.782)   | -0.744<br>(0.750)    | 0.372<br>(0.916)     |
| Debt from institutions/<br>book assets                                            | 4.853**<br>(2.040)   | 4.902**<br>(2.038)   | 4.888**<br>(2.045)  | 4.463**<br>(2.108)  | 5.775*<br>(2.045)    | 5.932*<br>(2.310)    |
| Firm is a corporation (0, 1)                                                      | 2.819***<br>(1.635)  | 2.857***<br>(1.633)  | 2.827***<br>(1.638) | 3.248***<br>(1.726) | 2.597<br>(1.632)     | 5.267*<br>(1.936)    |
| Firm age (in years) <sup>a</sup>                                                  | -0.142***<br>(0.081) | -0.150***<br>(0.081) | -1.531<br>(1.080)   | -0.181**<br>(0.084) | -0.140***<br>(0.081) | -0.164***<br>(0.093) |
| Length of longest relationship<br>(in years) <sup>a</sup>                         | -0.155**<br>(0.069)  | -0.152**<br>(0.069)  | -2.299**<br>(1.089) | -0.165**<br>(0.070) | -0.150**<br>(0.068)  | -0.177**<br>(0.078)  |
| Debt from financial service<br>provider (%)                                       | -5.576*<br>(1.672)   |                      | -5.385*<br>(1.678)  | -5.555*<br>(1.748)  | -5.713*<br>(1.663)   | -6.976*<br>(1.907)   |
| Debt from financial service<br>provider (only one service) (%)                    |                      | -7.630*<br>(2.085)   |                     |                     |                      |                      |
| Debt from financial service<br>provider (multiple services) (%)                   |                      | -3.895**<br>(1.958)  |                     |                     |                      |                      |
| Number of institutions from<br>which firm borrows                                 | 1.926**<br>(0.900)   | 1.872**<br>(0.900)   | 1.991**<br>(0.901)  | 2.286**<br>(0.946)  | 1.840**<br>(0.897)   | 1.546<br>(1.043)     |
| Herfindahl index for financial<br>institutions (1, 2, or 3)                       | -2.253*<br>(0.866)   | -2.300*<br>(0.865)   | -2.274*<br>(0.866)  | -2.065**<br>(0.902) | -1.901**<br>(0.866)  | -2.659*<br>(0.996)   |
| Sales growth (1986-1987)                                                          |                      |                      |                     | -1.445<br>(1.086)   |                      |                      |
| Mean 1987 gross profits/assets ratio<br>in two-digit SIC industry                 |                      |                      |                     |                     | -28.245*<br>(8.643)  |                      |
| Mean $\sigma$ (gross profits/assets) between<br>1983-87 in two-digit SIC industry |                      |                      |                     |                     | 22.677*<br>(7.851)   |                      |
| Late payment stretch<br>(in days) <sup>b</sup>                                    |                      |                      |                     |                     |                      | 0.012<br>(0.019)     |
| Fraction of firms paying $\geq$ 50% of trade<br>credit late                       |                      |                      |                     |                     |                      | 84.997*<br>(5.758)   |
| Number of observations                                                            | 1,119                | 1,119                | 1,119               | 1,019               | 1,119                | 857                  |
| $\chi^2$                                                                          | 83.5                 | 86.2                 | 80.7                | 86.3                | 96.6                 | 127.1                |
| (p-value)                                                                         | (0.000)              | (0.000)              | (0.000)             | (0.000)             | (0.000)              | (0.000)              |

<sup>a</sup>We replace length of relationship and firm age by the natural log of one plus the length of relationship and firm age in column 3. Thus the coefficient measures the change in the interest rate due to a one percent increase in the firm's age or the length of its longest relationship.

<sup>b</sup>For each two-digit SIC industry, the median DPO is obtained for firms paying less than 10 percent of credit late. This is subtracted from the DPO for firms paying more than 50 percent of credit late to obtain the late payment stretch.

\*Significant at the 1 percent level.

\*\*Significant at the 5 percent level.

\*\*\*Significant at the 10 percent level.

relationship length has about 138 percent of the impact that firm size has on the availability of credit while it has no impact on the price of credit.

Firms are less likely to pay late when their lenders are more informed. The coefficient on the fraction of debt from institutions that provide financial services is  $-5.6$  ( $t = 3.3$ ). If the provision of services is a good measure of the closeness of the lending relationship, then lenders who provide more services are closer and should increase availability even more. This is indeed the case (Table VIII, column 2). A firm can reduce late payments by increasing the fraction it borrows from an institution providing a single service ( $\beta = -3.9$ ), but increasing the fraction borrowed from an institution providing two or more services has almost twice the effect ( $\beta = -7.6$ ). Providing more information to lenders has little effect on the price of credit (see Section III), but it significantly increases its availability.

In Section III we found that concentrated borrowing is correlated with cheaper credit. It is also correlated with greater availability of credit. An increase of one in the number of institutions from which the firm borrows increases late payments by almost two percentage points (Table VIII, column 1). When banks and nonbanks are considered separately, the effect of an increase in the number of banks is statistically and economically more important than an increase in the number of nonbank institutions. The coefficients are 2.5 versus 1.8, although we do not report this regression in the table. Finally, following our calibration, the number of banks has 142 percent of the impact on the availability of credit that size has. Recall that in Section III, we found the number of banks to have only 53 percent of the impact that size has on the price of credit.

Interestingly, credit availability for firms in more geographically concentrated banking markets is significantly higher. A firm in the most concentrated area reduces late payments by 4.6 percentage points when compared to a firm in the most competitive area. By comparison, concentration of the local financial market has only a small and statistically insignificant effect on the price of credit (see Table IV). Petersen and Rajan (1993) explore this issue in greater detail. They argue that a possible reason banks help out small firms is because of the possibility that such firms generate significant future business when they grow. In return for a stake in the firm's future, the bank lends even when no one else will. Unfortunately, the firm cannot explicitly commit to giving the bank a stake, because banks in the United States are statutorily prohibited from holding equity in firms. This implies that the bank has to rely on an implicit promise that it will receive the firm's future business. In a concentrated market, such a promise is more credible because the firm has few options (until it grows large enough to approach arm's length markets). They find evidence consistent with such an explanation.

According to our hypothesis, firms could finance themselves with greater amounts of expensive trade credit, not just when institutions restrict their access to credit but also when they have better investment opportunities. A potential problem with our results is that we may not be measuring investment opportunities correctly. If firms with good investment opportunities are

relatively young, have short relationships, and use multiple lenders to fund their investments, we would find that all three variables are correlated with our measures of usage of trade credit. Under the assumption that high-growth firms have above average investment opportunities, sales growth is a proxy for investment opportunities. If our relationship variables are better proxies for investment opportunities than for relationships, the inclusion of sales growth in the regression should reduce the magnitude of the coefficients dramatically. We report the coefficients in the fourth column of Table VIII. Two of the three relationship coefficients *increase* in magnitude. The coefficient on the fraction of debt from institutions that provide financial services decreases slightly. We find similar results when we use book assets to sales as a proxy for investment opportunities, suggesting that our relationship variables are not proxies for investment opportunities. We also include the industry mean profits and mean standard deviation of profits as defined in Section III. These coefficients have the correct sign and are statistically significant, but they do not change our estimates of the coefficients on the relationship variables (see Table VIII, column 5).

As a further check, we include in the regression proxies for standard industry practice in regard to paying late. If most firms pay late, paying late must not be very costly. Therefore the fraction of firms in the two-digit SIC industry paying more than 50 percent late is an inverse measure of the penalty for paying late. The Late Payment Stretch in the two-digit SIC industry is a second measure of the net benefit of paying late. Though we lose a number of observations when we include these two variables, the relationship coefficients are not significantly altered by these additions. Two of the relationship coefficients are higher and one is lower.<sup>27</sup> Thus the regression is robust to proxies for the costs and benefits of paying late.

The extent to which a firm takes cash discounts for early payment is an (inverse) measure of credit availability and should be driven by the same factors that make a firm avoid penalties for late payments. Thus, the regression with “discounts taken” as the dependent variable should be viewed as a test of the robustness of our results. We expect the coefficients on the relationship variables to have the opposite sign in comparison to the previous regression. The results are reported in Table IX and confirm our earlier results. Stronger relationships are correlated with greater credit availability. The only additional point to note in these regressions is that in column 6 of Table IX, we include the implicit interest rate calculated from standard terms

<sup>27</sup> We lose observations because we only include firms in industries with at least 10 firms. This restriction ensures our estimates of medians are reasonable. Ideally, we should define the Late Payment Stretch as the difference in DPO between firms paying 100 percent of their credits late and those paying 0 percent late. We use the definition in Section IV.A so as to get sufficient observations to estimate medians precisely in each group.

Table IX

## Credit Availability and the Role of Relationships

## Dependent Variable: Offered Discounts Taken by the Firm (%)

The dependent variable is the percentage of early payment discounts that are taken by the firm. The coefficient estimates are from a tobit regression with two-sided censoring. The dependent variable is censored at 0.0 and 1.0. Asymptotic standard errors are in parenthesis. Except for column 6, each regression also includes seven industry dummies based on the one-digit SIC codes.

| Independent variable                                            | (1)                  | (2)                  | (3)                  | (4)                  | (5)                  | (6)                   | (7)                  |
|-----------------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-----------------------|----------------------|
| Log(book value of assets)                                       | 6.795*<br>(1.679)    | 6.554*<br>(1.691)    | 7.650*<br>(1.670)    | 6.747*<br>(1.778)    | 6.541*<br>(1.678)    | 8.549*<br>(2.718)     | 6.750*<br>(1.751)    |
| Profits/book assets                                             | 7.485*<br>(2.399)    | 7.657*<br>(2.419)    | 7.706*<br>(2.428)    | 6.493**<br>(2.624)   | 7.593*<br>(2.373)    | 14.022**<br>(5.601)   | 8.144*<br>(2.600)    |
| Debt from institutions/<br>book assets                          | -14.178**<br>(7.161) | -14.326**<br>(7.168) | -14.825**<br>(7.217) | -16.020**<br>(7.437) | -15.736**<br>(7.184) | -34.934**<br>(13.736) | -14.326**<br>(7.353) |
| Firm is a corporation<br>(= 1 if yes)                           | -9.913***<br>(5.697) | -9.844***<br>(5.696) | -9.811***<br>(5.732) | -12.751**<br>(6.085) | -8.831<br>(5.713)    | -29.610*<br>(11.277)  | -8.643<br>(5.968)    |
| Firm age (in years) <sup>a</sup>                                | 0.900*<br>(0.246)    | 0.911*<br>(0.246)    | 6.612***<br>(3.474)  | 0.972*<br>(0.271)    | 0.899*<br>(0.246)    | 1.085*<br>(0.392)     | 1.003*<br>(0.254)    |
| Length of longest relationship<br>(in years) <sup>a</sup>       | 0.904*<br>(0.219)    | 0.901*<br>(0.219)    | 17.154*<br>(3.689)   | 0.878*<br>(0.227)    | 0.884*<br>(0.218)    | 0.598***<br>(0.320)   | 0.841*<br>(0.224)    |
| Debt from financial service<br>provider (%)                     | 5.655<br>(5.667)     |                      | 4.415<br>(5.705)     | 5.875<br>(5.969)     | 5.919<br>(5.660)     | 10.517<br>(9.670)     | 5.650<br>(5.817)     |
| Debt from financial service<br>provider (only one service) (%)  |                      | 10.159<br>(6.939)    |                      |                      |                      |                       |                      |
| Debt from financial service<br>provider (multiple services) (%) |                      | 1.539<br>(6.731)     |                      |                      |                      |                       |                      |
| Number of institutions from<br>which firm borrows               | -8.889*<br>(3.152)   | -8.790**<br>(3.152)  | -9.754*<br>(3.165)   | -9.486*<br>(3.331)   | -8.789*<br>(3.155)   | -11.192**<br>(5.194)  | -7.505**<br>(3.272)  |
| Herfindahl index for financial<br>institutions (1, 2, or 3)     | 14.996*<br>(3.033)   | 15.111*<br>(3.035)   | 14.608*<br>(3.050)   | 15.658*<br>(3.189)   | 14.170*<br>(3.038)   | 16.202*<br>(5.140)    | 14.449*<br>(3.136)   |
| Sales growth (1986-1987)                                        |                      |                      |                      | 1.254<br>(3.744)     |                      |                       |                      |

Table IX—Continued

| Independent variable                                                           | (1)     | (2)     | (3)     | (4)     | (5)                    | (6)                | (7)                 |
|--------------------------------------------------------------------------------|---------|---------|---------|---------|------------------------|--------------------|---------------------|
| Mean 1987 gross profits/assets ratio in two-digit SIC industry                 |         |         |         |         | 78.292**<br>(33.676)   |                    |                     |
| Mean $\sigma$ (gross profits/assets) between 1983–87 in two-digit SIC industry |         |         |         |         | – 69.090**<br>(27.350) |                    |                     |
| Interest rate implied by trade credit terms in two-digit SIC industry          |         |         |         |         |                        | – 0.017<br>(0.063) |                     |
| Discount stretch (in days) <sup>b</sup>                                        |         |         |         |         |                        |                    | – 0.036<br>(0.190)  |
| Fraction of firms taking $\geq$ 90% of early payments discounts                |         |         |         |         |                        |                    | 146.60*<br>(29.188) |
| Number of observations                                                         | 1500    | 1500    | 1500    | 1362    | 1500                   | 545                | 1328                |
| $\chi^2$                                                                       | 194.1   | 195.3   | 185.7   | 183.1   | 202.8                  | 76.7               | 216.5               |
| ( <i>p</i> -value)                                                             | (0.000) | (0.000) | (0.000) | (0.000) | (0.000)                | (0.000)            | (0.000)             |

<sup>a</sup>We replace length of relationship and firm age by the natural log of one plus the length of relationship and firm age in column 3. Thus the coefficient measures the change in the interest rate due to a one percent increase in the firm's age or the length of its longest relationship.

<sup>b</sup>For each two-digit SIC industry, the median DPO is obtained for firms taking more than 90 percent of discounts offered. This is subtracted from the DPO for firms taking less than 10 percent of discounts offered to obtain the discount stretch.

\* Significant at the 1 percent level.

\*\* Significant at the 5 percent level.

\*\*\* Significant at the 10 percent level.

of trade credit for the two-digit industry to which the firm belongs.<sup>28</sup> We lose two thirds of our observations, so these results must be interpreted with caution. We find that higher implicit rates have almost no effect on the percent of discounts taken. The coefficient is actually negative, but its magnitude is tiny. That the implicit interest rate has so little effect may imply that we are measuring it very inaccurately or that trade credit costs so much more than other sources that managers do not use it unless they have no other source of capital, an assumption implicit in our analysis.<sup>29</sup>

Clearly, our evidence that trade creditors lend when institutional lenders do not suggests that they have collateral, incentives related to the product they are selling, sources of leverage over the firm, or information that the institutions do not possess. Is it then possible that our relationship variables identify firms whose strong supplier relationship—and hence cheap trade credit—substitute for bank relationships and bank credit? For instance, suppliers may allow younger firms greater leeway in stretching out their trade credit repayments. If so, the negative correlation between age (or length of relationship) and the extent of late payments simply reflects the fact that the implicit cost of trade credit is lower for young firms. The data in Table VII, Panel B, however, do not support this explanation. The median stretch (as measured from the due date) for the youngest 10 percent of the firms is  $-5.86$  days compared to a median stretch of  $-0.72$  days for the oldest ten percent of the firms. Similarly, the median stretch for the smallest 10 percent of the firm is  $-17.91$  days compared to a median stretch of  $2.85$  days for the largest 10 percent of the firms (see Table VII, Panel A). If, as suggested in Section IV.B, trade credit terms are uniform in an industry, it would imply that firms borrowing the most against trade credit are allowed considerably

<sup>28</sup> The terms were obtained from Dunn and Bradstreet's *Handbook of Credit and Collection* (1970). We obtained standard terms for 46 four-digit SIC industries which translated into 19 two-digit industries. We calculated the implicit interest rate assuming that the credit period began on the last day the discount could be used and continued till the day the payment was due (this assumption is consistent with our finding that the stretch in the retail and wholesale industry is somewhat smaller than the 20 days implied by the 2-10-30 rule). Whenever we had different terms for the same two-digit industry, we took a simple mean of the calculated implicit interest rates. The largest implicit interest rate (without considering those with cash terms where the due date and the discount date were the same) was 348 percent, and the lowest was 15 percent. The mean rate was 70 percent. The most common terms were 2-10-30, which were offered in 23 of the 46 four-digit SIC industries.

<sup>29</sup> Does the fact that firms borrow against trade credit even when the average implicit interest rate on the credit is 70 percent imply that the rate of return on the firm's marginal projects is higher than 70 percent? Clearly not. But as the following example shows, project indivisibility or nonconvexity is enough to rationalize the use of expensive trade credit. Consider a firm which has a \$100,000 investment in equipment which will be liquidated at a fire sale price of \$90,000 (see Shleifer and Vishny (1992)) if creditors get control rights over the firm. Further, assume a coupon payment of \$5,000 is coming due. If the firm has no money to make this payment and no institution will lend more, it may borrow the \$5,000 against trade credit to make the payment, in order to avoid the potential loss of \$10,000 if creditors gain control. Even though the potential loss from project liquidation is only 10 percent of its value, the rate of return on the usage of trade credit is enormous. A similar point can be made for project initiations.

less stretch, and consequently pay considerably higher implicit interest rates on their trade credit borrowing. By contrast, interest rates on institutional loans are relatively less influenced by age and size (see Tables IV and X).

There is further evidence that trade credit is not meant to be a cheap substitute for medium-term financing. It is the practice in some industries for suppliers to finance buyers. The large volume of loans from nonfinancial firms in those industries is evidence of this. If supplier financing is explicitly intended to be medium term, we would not expect trade credit to be offered with discounts for early payment. This is indeed the case. Firms which have their largest source of loans from other nonfinancial firms were offered, on average, discounts with only 22.7 percent of their trade credit. By contrast, other firms are offered discounts on 32.9 percent of their trade credit. The difference in means is significant at the 5 percent level ( $t = 2.4$ ). While trade credit may be the only source of finance when firms are young, the evidence that firms borrowing most on trade credit pay relatively the highest rates for it, and the evidence that suppliers who want to offer medium term credit offer explicit loans rather than trade credit, suggests that firms use trade credit out of necessity rather than choice.

A final possibility is that the relationship variables somehow proxy for firms in distress. If small, highly leveraged, and floundering firms are cut off by institutions (thus cutting short their relationship), and are forced to use trade credit, we would find a spurious negative correlation between the length of the relationship and the usage of trade credit. Are the firms using lots of trade credit necessarily distressed? The median firm repays 10 percent of its trade credits late. For firms paying more than the median late, the

**Table X**  
**Average Interest Rates on Most Recent Loan**

The table contains the average interest rate on the firm's most recent loan categorized by the firm's book value of assets, the percent of trade credits paid late, and the percentage of early payments taken. The first row of the table contains the smallest firms, the firms that pay the largest percent of their trade credits late, and the firms that take advantage of the fewest early payment discounts.

|         | Percentiles Based on the<br>Book Value of Assets | Percentiles Based on the<br>Percent of Trade Credits<br>Paid Late | Percentiles Based on the<br>Percent of Early<br>Payment Discounts Taken |
|---------|--------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------|
| 0-10%   | 12.0                                             | 11.4                                                              | 11.2                                                                    |
| 10-25%  | 11.5                                             | 11.9                                                              | 11.1                                                                    |
| 25-50%  | 11.5                                             | 11.4                                                              | 11.1                                                                    |
| 50-75%  | 10.8                                             | 11.2                                                              | 10.8 <sup>a</sup>                                                       |
| 75-90%  | 10.5                                             | 10.7                                                              | 10.8                                                                    |
| 90-100% | 10.1                                             | 10.4                                                              | 10.8                                                                    |

<sup>a</sup>Over 25 percent of the firms take all of the early payment discounts that are offered. Thus the groups 50-70 percent, 75-90 percent, and 90-100 percent are not distinct. Thus 10.8 percent is the average interest rate for firms taking more than the median percent of the early discounts which they are offered.

mean asset size is \$1.17 million, the mean profitability (as a fraction of assets) is 0.35, the mean sales growth is 0.25, and the mean debt-to-assets ratio is 0.32. This compares to a mean asset size of \$1.21 million, mean profitability of 0.44, sales growth of 0.19, and indebtedness of 0.26 for firms below the median. Only the debt levels are statistically different, though this may not reflect distress but simply that firms paying late are investing more (and hence are less profitable either because projects have not come on line or because they have greater depreciation tax shields) and using external financing. We also examine the difference between the age of the firm and the length of the longest relationship. If highly indebted firms are being cut off by their banks, leading to the spurious correlation suggested above, we should find the difference to be the highest in the case of the most indebted firms. Instead, we find that the longest relationship for highly indebted firms—firms with institutional debt above the median—is 1.3 years longer (relative to their age) than for firms with institutional debt below the median. Finally, Table X shows the average interest rate charged on the firm's most recent institutional loan. Firms using the most trade credit do not pay substantially more for their loans, suggesting indeed that we are measuring some form of credit rationing and not some spurious correlation arising from distress.

## V. Discussion and Conclusion

We began our empirical investigation by noting that borrowing by small firms is highly concentrated. Moreover, small firms borrow a significant fraction of their debt from lenders who provide them informationally intensive financial services. Are there benefits to concentrating borrowing and building relationships with a few lenders or is such concentrated borrowing costly? Our analysis indicates the former.

We find a small effect of relationships on the price charged by lenders. The length of an institution's relationship with the firm seems to have little impact on the rate. Similarly, the rate charged is insignificantly lower when the lender provides the firm financial services. We find that firms that borrow from multiple banks are charged a significantly higher rate. There are a number of potential explanations of this effect, other than that multiple sourcing weakens relationships, but we do not find strong support for any of them.<sup>30</sup>

It does not appear that the lack of explanatory power occurs because our proxies for the strength of relationships are faulty. Using similar proxies, we

<sup>30</sup> Conversations with bankers provide some casual support for the "weakening of relationships" explanation. One banker said that he invariably tries to be the sole lender. If the firm asking for a loan has a prior relationship with another bank, he usually insists on "taking out" the prior bank with part of the new loan. Being the sole lender improves his ability to control the borrower's actions. Another banker echoes these feelings, adding that firms tend to change banks primarily when their existing bank reaches its legal lending limits. In such cases, a firm occasionally insists on maintaining token ties with its old bank. He also feels that some small business owners have "outsize egos," leading them to believe that their firms are big enough to warrant multiple banking relationships, even though it is a costly practice.

find stronger effects of relationships on the availability of financing. The empirical results suggest that the availability of finance from institutions increases as the firm spends more time in a relationship, as it increases ties to a lender by expanding the number of financial services it buys from it, and as it concentrates its borrowing with the lender.

The results from the previous section rule out the possibility that relationships have no value. They also indicate that our proxies are indeed capturing some aspects of relationships. There are at least two theoretical explanations as to why the burden of adjustment to strong relationships falls on the availability of credit more than it does on price. First, if Stiglitz-Weiss credit rationing is indeed taking place, the firm's marginal returns from investment may be much higher than the price of credit. Therefore, if offered a choice, firms would prefer more, rather than cheaper, credit. Unfortunately, peripheral evidence on this hypothesis is decidedly mixed. When the SBA Survey asked firms about the most important characteristic of financial institutions, "interest rates and prices offered" was the most frequent response (27.3 percent) while "a willingness to extend financing" was in second place (23.8 percent). However, when asked about the least important characteristic of financial institutions, "a willingness to extend financing" was the least common response (5.6 percent) while "interest rates and prices offered" came next (10.8 percent).

The other theoretical explanation is that while the relationship reduces the lender's expected cost, it also increases its informational monopoly, so that cost reductions are not passed on to the firm. We cannot distinguish between these two possibilities.

The different effects on price and quantity may also stem from the organizational structure of lending institutions. In order to maintain adequate checks and balances in their business, financial institutions have fairly specific guidelines for loan pricing. It would be difficult, and perhaps defeat their purpose, for the institution to set these guidelines such that the loan officer's "soft" information about the firm can be embedded in the price. Given this structure, it may be much easier for the loan officer to use her knowledge to influence the loan amount and whether the loan is made at all, rather than the price.

Our study also throws additional light on another important public policy issue. A bank may have economic value because it screens out poor credits. But once the public credit market knows which firms are good (by observing firms that have had a long relationship), there is no externality imposed on the firms if the bank fails or is forced to contract its lending. On the other hand, if a bank generates substantial durable and nontransferable private information during the course of a relationship, there may be significant externalities when it fails or reduces lending commitments, because others cannot easily step into the breach (see Bernanke (1983)). Slovin, Sushka, and Polonchek (1993) provide evidence that banks may, in fact, serve as repositories of private information. They find that the impending insolvency of Continental Illinois Bank had negative effects and the FDIC rescue had positive effects on client firm prices. Our study adds to theirs by detailing the

mechanisms through which the bank may acquire information about the firm, and how it passes on the benefits of this more intense monitoring back to the firm.<sup>31</sup> The public policy implication is that regulators should factor in the informational capital that will be destroyed when deciding whether to save a bank from liquidation.

Perhaps the most interesting conclusion of our study is that the apparent concentration of borrowing and the purchasing of financial services does not seem to make small firms worse off. Small firms may voluntarily choose to concentrate their borrowing so as to improve the availability of financing. Furthermore, we find that firms in areas where there are few bank-like institutions are less likely to be rationed. This accords with the notion in Mayer (1988) and Rajan (1992) that increased competition in financial markets reduces the value of relationships because it prevents a financial institution from reaping the rewards of helping the firm at an early stage. The policy implication is that these firms may best be helped if lenders can make their claims to the firm's future profits explicit; for instance, regulations prohibiting banks from holding equity could be weakened so that banks have an explicit long-term interest in the firms to which they lend.

<sup>31</sup>On its own, our study cannot fully resolve whether the information generated in a relationship is private or public. It is possible that the length of the relationship is a significant determinant of the availability of credit, not because the creditor has accumulated private information about the firm, but because creditors attempt to keep the business of their best credits as long as possible. The length of the relationship may then be a publicly available proxy, similar to the age of the firm, of a firm's creditworthiness. It is, however, harder to explain why availability increases as creditors come closer—where "closeness" is measured by the number of nonfinancial services they offer the firm—unless we accept that some private information is generated via these services. None of these services are so specialized or sophisticated that only "high-quality" managers would think of using them. Only a few of these services (banker's acceptances and letters of credit) force the bank to take on credit risk, and these commitments are usually short term and well secured so that the credit risk is minimal. It is hard to think of how the provision of these services could be a public signal of quality. It is, however, possible that the provision of these services helps tie the firm to its creditor in the long run, making the creditor more willing to extend funds.

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