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Introduction

Despite financial economists' long-standing interest in the role of lender-borrower relationships in increasing the availability of funds to small businesses, many questions remain unanswered. Numerous empirical studies investigate the effect of relationships on the availability and terms of credit to small businesses (Petersen and Rajan (1994), Berger and Udell (1995), Blackwell and Winters (1997), Cole (1998), Harhoff and Körting (1998), Elsas and Krahnen (1998), Angelini et al.(1998), Degryse and van Cayseele (2000), Bodenhorn (2003)) and many find that relationships improve the availability of credit for some categories of small businesses. But the studies present mixed results on how relationships affect collateral requirements and lending rates, as well as whether relationships affect loan terms and availability via reputation enhancement, as modeled by Diamond (1991) and Boot and Thakor (1994), or via information capture, as modeled by Greenbaum et al. (1989) and Sharpe (1990).

Much of the empirical relationship lending research focuses on line-of-credit loans. Lines of credit are forward commitments financial intermediaries (FIs) make to lend up to a pre-specified amount over a set time period under terms agreed to when the commitment is made. Lines of credit are intended mainly to finance the acquisition and holding of working capital. Researchers who focus on lines of credit in the study of relationship lending claim to do so because lines of credit are, by their design, "relationship-driven" loans. They also claim that such traditional FI loans as mortgages, equipment loans and motor vehicle loans are "transaction driven" rather than "relationship driven" because businesses use them to finance one-time, non-

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recurring credit needs (e.g., Berger and Udell (1998)). Moreover they assert that because traditional loans finance real assets that can serve as loan collateral, such loans entail fewer information asymmetries and pose less credit risk to the lending FI, thereby obviating the need for an on-going lending relationship (cf. Haynes et al.(1999)). According to this view, smaller information asymmetries and credit risk should cause traditional small business loans to resemble more closely loans to large corporations over public securities markets than to relationship-driven loans (cf. Boot and Thakor (2000)).

While traditional small business loans may indeed involve looser lender-borrower relationships than line-of-credit loans, it does not follow that relationships play no role in traditional lending. Perhaps the most compelling evidence favoring a possible role for relationships is the slowness with which traditional small business loans have become securitized (Acs (1999)). The usual explanations for the irrelevance of relationships in traditional lending presuppose that: 1) small business owners seeking traditional loans to finance large, infrequently occurring capital acquisitions are chiefly concerned with getting the lowest possible interest rate, making relationships irrelevant to borrowers; and 2) collateralizing loans protects lenders from information asymmetries and other contracting problems before and after a loan is made, making relationships irrelevant to lenders. While these presumptions may be warranted for small, "life-style" businesses with no appreciable growth opportunities, neither premise need hold as a general rule, as explored below.

Rational business owners with long-term horizons presumably make investment, financing, and operating decisions to optimize owner wealth over the long-term. If owners anticipate growth in the scale of operations, they will need to raise funds to acquire tangible assets and working capital in multiple periods. This on-going funds need gives owners an incentive to view fundraising as a repeated game rather than a one-time event. On-going funds needs also give owners an incentive to reduce information asymmetries which prevent lenders from costlessly verifying owners' characters or firms' quality and which adversely affect the terms and availability of credit. Owners should, in principle, be able to overcome the asymmetries by building good reputations with their lenders through paying regular debt service on any loans, be they traditional or line-of-credit loans. In summary, just because firms take out loans to buy tangible assets less frequently than loans to fund working capital, it does not follow that small business owners pursue one strategy for financing tangible assets and another for financing working capital: rational owners should instead follow a single coherent strategy of relationship building using all types of loans so as to reduce the costs imposed by information asymmetries.[1]

Relationships may also be useful to lenders who make traditional loans. The premise that information asymmetries and credit risk are inconsequential to traditional loans stems from the availability of tangible assets to secure such loans. However, the costs of perfecting a secured claim against an asset, repossessing it in the event of loan default and liquidating it are significant (cf. Mann (1997)). Significant costs to the use of collateral raise FIs' lending rates and/or reduce the loan size per dollar of collateral needed for a given level of protection from credit risk. But FIs with private information gleaned from relationships could potentially make larger loans at lower rates or even reduce the amount of collateral pledged, while maintaining the same degree of protection from credit risk. Hence, the existence of collateral for traditional FI loans does not make relationships irrelevant to lenders.

[1] There is an analogous argument from the venture capital literature. Start-up and young firms seeking to raise equity from outside investors are advised to look beyond the offer price, since equity investors often bring other elements to the deal besides financing, including valuable connections with potential suppliers and customers.

The role of relationships in traditional lending to small businesses is an empirical question which has not, to our knowledge, been addressed in the literature. This paper explores the impact of relationships on traditional lending by estimating three types of models found in the literature on relationship lending: models of loan acceptance, models of security, and models of lending rate. Researchers have employed such models in previous studies chiefly to study the impact of relationships on lenders' decisions to accept, secure and price line-of-credit loans. We employ these models here to study the impact of relationships on lenders' decisions about both line-of-credit loans and traditional loans.

We believe this paper makes several useful contributions. To our knowledge it is the first to present empirical evidence in a US context specifically on the impact of lender-borrower relationships on traditional, non-line-of-credit loans.[2] In addition, our study employs data from the relatively little-used 1998 Survey of Small Business Finances (SSBF). Moreover this study is, to our knowledge, the first to present in one paper models estimated on US data for all three of the variables studied empirically in the relationship lending literature: credit availability, security requirements and loan rate.[3] We present estimated models for both traditional loans and line-of-credit loans. By presenting models of all three variables for both types of loans, we believe we present a more complete picture of the role relationships play in small business lending.

To preview our results, we find that relationships have statistically significant effects on the probability of loan acceptance, collateral/guarantee requirements and loan rates for both lines of credit and traditional loans. Moreover we find that relationships appear to affect more strongly the availability and terms of traditional loans than lines of credit. While we find evidence consistent with both the reputation enhancement and information capture views of relationships effects, we conclude that the evidence more consistently supports the information capture view.

The rest of the paper is organized as follows. Section II summarizes the relevant theoretical and empirical literature on relationship lending. Section III presents our hypotheses and describes the data. Section IV presents the empirical results. Section V summarizes and concludes.

I. Small Business Lending: Theory and Evidence

A. Financial Contracting with Large and Small Businesses

The US financial system has developed different technologies for transferring funds from investors to large and small businesses. Large businesses raise funds in both private and public securities markets. Participation in public markets legally obligates large firms to make public information about themselves, primarily for the purpose of permitting investor monitoring. But large businesses also voluntarily enhance their "informational transparency" in a variety of ways, including significant spending on investor relations, so as to facilitate future fund-raising by reducing problems related to asymmetric information, adverse selection and moral hazard.[4]

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[2] The study by Degryse and van Cayseele (2000) which uses Belgian data is the only other study we know that examines the impact of relationships on traditional, non-line-of-credit loans; however it is unclear whether Belgian banks make loans comparable to line-of-credit loans.

[3] Among the empirical studies of relationship lending of which we are aware only the study by Harhoff and Körting (1998) looks at the effect of relationships on all three variables, however they do so using German data.

[4] The terms "informational transparency" and "informational transparency", used later, stem from Berger and Udell (1993).

In contrast to large businesses, small businesses lack access to public securities markets because the costs of removing information asymmetries and of monitoring contract compliance exceed the benefits to the contracting parties. Instead of raising funds directly from investors through financial markets, "informationally opaque" small businesses raise funds indirectly from investors through financial intermediaries (FIs) -- especially commercial banks – which obtain funds from investors by selling securities and/or accepting deposits. Small businesses are able to obtain funds from FIs because FIs reduce the costs of financial contracting so as to make it mutually beneficial to both parties. FIs accomplish this cost reduction in several ways. FIs reduce risk to investors by issuing securities and deposits written on diversified portfolios of financial contracts with small businesses. FIs also reduce the problems stemming from information asymmetry by developing unique information sources and superior information processing skills. Finally, FIs excel at designing contract terms that facilitate monitoring and encourage small businesses to repay. In summary, FIs are as critical to the transfer of funds from investors to small businesses as financial markets are to the transfer of funds from investors to large businesses.

B. Relationship Lending

Stiglitz and Weiss (1981) show that in credit market equilibrium profit-maximizing FIs ration credit to informationally opaque borrowers rather than raising interest rates and/or loan collateral requirements because doing so could lead to adverse selection. The threat of rationing creates a powerful incentive for such borrowers as small businesses to seek methods of becoming transparent to FIs. Forming close relationships with FIs is one widely discussed method.

B.1. Theoretical Papers on Relationship Lending

Theoretical papers that analyze the effects of relationships on credit availability and credit terms yield contradictory predictions. Models by Diamond (1991) and Boot and Thakor (1994) find that relationships improve credit availability and credit terms to borrowers. In both models informationally opaque firms seek credit from FIs because asymmetric information and potential moral hazard problems prevent the firms from raising funds directly through public markets. In Diamond's model a firm can build a good reputation with a FI before receiving credit (by refraining from morally hazardous behavior) and after receiving credit (by continuing to refrain from morally hazardous behavior and by repaying the loan). Diamond shows that a good reputation eventually becomes so valuable to the firm that risk of its loss prevents the firm from ever engaging in morally hazardous behavior, thereby permitting the firm to move from intermediated loans to cheaper unintermediated ones. In Boot and Thakor's model firms unknown to a FI must borrow at above-market rates using secured (collateralized) loans. Securing the loan reduces the firm's incentive to engage in morally hazardous behavior and reduces the loan rate the FI charges. However, securing the loan also dissipates project benefits and results in a deadweight loss. Owing to this loss, Boot and Thakor show the sustainability of a repeated game in which a FI rewards a borrower that repays a loan with lower collateral requirements and a below-market rate on all subsequent all loans. Thus credit terms improve with relationship length.

Theoretical papers by Greenbaum et al. 1989) and Sharpe (1990) reach the opposite conclusion. In both models a FI grants a loan to an informationally opaque firm. As the firm repays the loan the FI gains insight into the firm's quality; however, this information remains private with the FI. Absent market forces compelling the FI to adjust its lending rate according to customer quality, the FI instead exploits its informational advantage and monopoly power over the firm by charging an interest rate that exceeds the FI's cost of funds. High search costs

and the inability to convey credible information about firm quality to competing FIs deter the firm from seeking a new lender. Both models generate the result that, to an extent, FIs attempt to lure away one another's customers by offering loans at rates below costs so as to capture their own portfolios of monopoly profits; however fear of adverse selection tempers the competitive rate reductions. In both models low-quality firms get too much credit early in a new relationship when they are most informationally opaque to the FI. Thus, both models predict that new relationships makes credit more available but that lending rates worsen as relationships lengthen. Neither Greenbaum et al. nor Sharpe address the issue of collateral.

Several theoretical papers develop models of collateralized lending by FIs to informationally opaque firms. These, too, reach contradictory conclusions. Bester (1985) shows that if banks choose lending rates and collateral requirements simultaneously, a separating equilibrium obtains in which low-risk, high-quality firms choose loans with high collateral requirements and low interest rates whereas high-risk, low-quality firms choose loans with low collateral requirements and high interest rates. Besanko and Thakor (1987) get a similar result for banks lending in competitive markets. But models by Bester (1994) and Rajan and Winton (1995) generate the opposite result. Bester (1994) develops a model of "outside collateral," collateral owned by the firm's entrepreneur but not the firm. In Bester's model FIs observe borrowing firms' risk categories.[5] He finds that FIs require outside collateral only of riskier firms because outside collateral reduces the likelihood these firms will claim insolvency and ask to renegotiate their lending contracts when they are, in fact, able to pay. In Rajan and Winton's model, FIs require collateral of riskier firms because claim to valuable assets gives FIs incentives to monitor firms and acquire private information about them before loan default, incentives FIs do not have in the absence of collateral due to free rider problems.

B.2. Empirical Studies of Relationship Lending

Empirical studies of the effect of relationships on lending to small businesses have focused on relationships' effects on availability of credit, collateral requirements and lending rates. Table 1 summarizes the most recent empirical studies.

B.2.a. Empirical Studies of Credit Availability Effects of Relationships

Researchers studying the effects of relationships on credit availability have used a variety of approaches. Petersen and Rajan (1995) look for evidence that relationships improve credit availability by estimating models of trade credit repayment. Since trade credit is more expensive than loans from financial institutions, they reason that if lender relationships improve the availability of credit to borrowing firms, firms with relationships will be less likely to pay their suppliers late and more likely to pay quickly and take cash discounts for prompt payment. Petersen and Rajan estimate tobit models of the probability of late trade credit repayment and the fraction of cash discounts taken on data from the 1988-89 National Survey of Small Business Finances. They find that the longer a firm's longest banking relationship, the less likely it is to pay trade creditors late and the higher the fraction of cash discounts taken. Thus they conclude that relationships improve credit availability.

Cole (1998) takes a different approach to studying the effect of relationships on credit availability. He develops a logistic regression model of the probability that a firm's loan application will be approved and estimates it on data from the 1993 National Survey of Small Business Finances. Cole finds that firms applying to lenders with whom they have no prior

[5] A FI might have this information as the result of an existing relationship with the borrowing firm.

relationship are less likely to have their applications approved. Like Petersen and Rajan, Cole concludes that relationships improve credit availability.

Harhoff and Körting (1998) use the approach of Petersen and Rajan (1994) to study the effect of relationships on line-of-credit availability for a sample of small German firms. They find that credit becomes less available as the number of lenders increases, a result consistent with the declining value of FIs' private information as relationship exclusivity declines as well as declining incentives FIs have to monitor borrowers due to free-rider problems. Aside from this, Harhoff and Körting find no measurable effect of relationships on the availability of credit.

Angelini et al. (1998) investigate the effect of relationships on line-of-credit availability by developing a probit model of the factors that lead young firms to report themselves as being liquidity constrained. They estimate the model on a data sample of small young Italian firms and find that the longer firms' relationships with their primary banks, the less likely the firms are to report themselves as liquidity constrained. Angelini et al. conclude that relationships improve credit availability.

While the previously mentioned studies generally find that prior lending relationships improve credit availability for small firms, they do not specifically address the possibility that relationship may have differential effects on the availability of line-of-credit and traditional loans. Harhoff and Körting and Angel et al. both use European data on line-of-credit loans and reach contradictory conclusions. Petersen and Rajan and Cole both use American data on all loans and both conclude that relationships improve credit availability. But they do not address the possibility that relationships may have differential effects on the availability of line-of-credit and traditional loans.[6]

B.2.b. Empirical Studies of Collateral Requirement Effects of Relationships

Several empirical studies have addressed the effect of relationships on collateral requirements. Berger and Udell (1995) estimate logistic regression models of the probability that banks require collateral for line-of-credit loans. They find that the probability of collateral requirements decreases with increasing relationship length, consistent with the reputation enhancement view of relationship lending. However, this finding holds only for firms with total assets above the sample median: for firms with below-median assets relationship length has no statistically significant effect on collateral requirements. Like Berger and Udell, Harhoff and Körting (1998) find that the incidence of collateral securing credit lines declines with relationship length. But Degryse and van Cayseele (2000) find that banks are significantly more likely to require collateral from firms with whom the scope of the relationship is deepest, consistent with the information capture view.[7]

A possible explanation for the opposing empirical results found in the collateral studies lies with differences in loan types. Berger and Udell and Harhoff and Körting restrict their samples to bank lines of credit, whereas Degryse and van Cayseele's sample includes five types of non-line-of-credit loans: business mortgages, bridge loans, credit to prepay taxes, term loans and installment loans. These types include at least some loans often characterized as transaction-

[6] Cole (1998) comes closest to considering the possibility of differential effects. He re-estimates his final model on loans whose purpose is to finance working capital needs, which are usually financed with lines of credit. He finds that his model fits the data slightly better than when all loans are used. However he does not go on to re-estimate his final model on traditional loans for the purpose of comparing the relationship effects.

[7] Bodenhorn (2003) develops a model of the number of guarantors a bank requires on a loan. He estimates his model on 19th century US data using Poisson regression. He finds some support for the hypothesis that the number of guarantors declines with greater closeness in the lender-borrower relationship, as measured by frequency of borrowing and length of relationship.

driven loans (e.g., business mortgages). Hence the empirical evidence could be interpreted as showing that relationships influence collateral requirements as per the reputation enhancement view for bank lines-of-credit, but per the information capture view for more traditional FI loans. Of the previous empirical studies only Berger and Udell use American data. Whether American data would show that relationships affect collateral requirements for line-of-credit and traditional loans differently is an unexplored question.

B.2.c. Empirical Studies of Interest Rate Effects of Relationships

More investigated than the effect of lending relationships on credit availability or collateral requirements is the effect of lending relationships on interest rates. Petersen and Rajan (1994) develop a regression model of the loan rate and estimate it on a sample of line-of-credit and non-line-of-credit loans drawn from the 1988-89 National Survey of Small Business Finances. They find that lenders having stronger relationships with borrower firms offer interest rates no different from those they offer to new, unknown borrowers, contrary to both the revenue enhancement and information capture views. Berger and Udell (1995) argue that Petersen and Rajan's results stem from having aggregated relationship-driven line-of-credit loans together with transaction-driven non-line-of-credit loans, whose interest rates are market-determined rather than relationship-determined. Berger and Udell estimate a regression model of the spread over the prime lending rate paid by borrowers in a sample of line-of-credit loans drawn from the 1988-89 National Survey of Small Business Finances. They find that the lending rate decreases as a relationship lengthens, consistent with the reputation enhancement view of relationships. But this conclusion applies only to firms with above-median total assets; for smaller firms relationships have no statistically significant effect on lending rate. Following Berger and Udell, Blackwell and Winters (1997) develop a regression model of the spread over prime paid by small firms borrowing via lines of credit and estimate it on a proprietary data sample. They find that relationship length has no effect on loan rate but that loan rate does decline with a rise in the percentage of the borrowing firm's total outstanding debt lent by the relationship bank. Blackwell and Winters interpret their findings as being consistent with the revenue enhancement view. It should be noted that the firms in Blackwell and Winters' sample are substantially larger than those in 1988-89 NSSBF used by Berger and Udell and Petersen and Rajan.[8]

The effect of lending relationships on lending rate has also been the subject of several papers using European data. Harhoff and Körting (1998) estimate a model of the loan rate on a sample of line-of-credit loans to small German businesses and find little evidence that relationships affect the loan rate. Elsas and Krahnen (1998) reach a similar conclusion after estimating a model of the loan rate spread over FIBOR on a sample of line-of-credit loans to medium-size German firms. In contrast Angelini et al. (1998) estimate a regression model of the loan rate on a sample of line-of-credit bank loans to small Italian firms and find that loan rates increase with relationship length, consistent with the information capture view. Degryse and van Cayseele (2000) reach a similar conclusion from estimating a model of loan rate on data for non-line-of-credit bank loans to small Belgian firms.

A factor contributing to the contradictory findings on the effect of lending relationships on lending rates is heterogeneity in the sampled loan types, firm sizes, and institutional contexts. The two US studies that use line-of-credit loans suggest that lending relationships reduce loan

[8] Bodenhorn (2003) develops a model of the loan risk premium a bank requires on a loan. He estimates his model on 19th century US data using OLS regression. He finds some support for the hypothesis that the risk premium declines with greater closeness in the lender-borrower relationship, as measured by frequency of borrowing and length of relationship.

rates as per the reputation enhancement view, at least for small firms above a certain size. Of all the studies only Degryse and van Cayseele's (2000) investigates whether relationships influence loan rates for traditional, non-line-of-credit loans to very small firms, doing so in the Belgian context. They find evidence in favor of information capture. The contradictory results from previous studies combined with the dearth of evidence on how relationships affect loan rates for traditional loans warrant a new look at the relationship – loan rate nexus.

II. Hypotheses and Data

In light of the foregoing discussion we state our central hypotheses as follows:

- *H1*. Traditional (non-line-of-credit) loans to small businesses are "relationship loans" similar to line-of-credit loans.

- *H2*. Traditional (non-line-of-credit) loans to small businesses are "transaction loans" similar to capital market loans.

These opposing hypotheses capture the opposing perceptions of traditional loans reflected in previous empirical studies of relationship lending. H1 supports the approach of Petersen and Rajan (1994) and Cole (1998) of aggregating data on traditional and line-of-credit loans to study relationship effects, as well as the approach of Degryse and van Cayseele (2000) in using only traditional loans to study relationship effects. H2 supports the approach of Berger and Udell (1995), Blackwell and Winters (1997), Harhoff and Körting (1998), Elses and Krahnan (1998) and Angelini (1998) of excluding data on traditional loans in studying relationships on grounds that transaction loans are not relationship driven.

While the focus of our investigation is on H1 and H2, our work also produces evidence pertaining to two other hypotheses:[9]

- *H3.* As a borrower becomes more informationally transparent to a lender through an on-going relationship the lender improves the availability of credit, requires less security and decreases the loan rate.

- *H4.* As a borrower becomes more informationally transparent to a lender through an on-going relationship the lender does not change or even worsens the availability of credit, the amount of security required and the loan rate.

These opposing hypotheses capture the competing views of the effect of relationships on credit terms and availability found in the theoretical literature on relationship lending. H3 is consistent with models put forth by Diamond (1991) and Boot and Thakor (1994), whereas H4 is consistent the analysis of Greenbaum et al. (1989) and Sharpe (1990).

To test hypotheses H1 – H4 we estimate models having the following general form:

dependent variable = f (firm attributes, market attributes,
loan contract attributes, lender-borrower relationship attributes)
+ error term, (1)

[9] Hypotheses H3 and H4 are similar to hypotheses H2 and H1, respectively, in Harhoff and Körting (1998).

Following previous studies we estimate models for each of three different dependent variables: the probability that a lender accepts a loan application; the probability that a lender requires a loan to be secured with collateral or guarantees; and the interest rate a lender sets on a loan less the then-prevailing prime rate. For each variable we estimate models using data that include both traditional loans and line-of-credit loans; we then re-estimate the models using sub-samples of traditional loans and line-of-credit loans. The coefficient estimates of the lender-borrower relationship attributes provide evidence on hypotheses H1 – H4. In particular, H1 will be supported by the finding of statistically significant coefficient estimates for the relationship attributes in models estimated on data for traditional loans, while H2 will be supported if the coefficient estimates are statistically insignificant. For models estimated on the full sample of loans or either sub-sample, H3 will be supported by coefficient estimates for the relationship attributes that suggest improving loan terms whereas H4 will be supported by coefficient estimates that suggest unchanging or worsening terms.

The data used to estimate Equation (1) come from the 1998 Survey of Small Business Finances (SSBF). This survey, conducted at five-year intervals for the Federal Reserve Board, collects extensive financial and non-financial information on the surveyed firms, including information about their dealings with funding sources. The 1998 survey was conducted during 1999-2000 and queried a nationally-representative sample of small businesses in operation during December 1998. The survey defines a small business as a non-farm, non-financial business having fewer than 500 full-time employees. The 1998 sample surveyed 3,561 firms representative of the 5.3 million small businesses in operation during December 1998.[10]

A subsection of the SSBF inquires about a firm's most recent loan application including the lender's name, the extent of the lender-borrower relationship, whether the lender accepted or rejected the application and, if the application was accepted, features of the loan contract. Eight hundred seventy nine of the firms surveyed provided details of their most recent loan application. Of these, 17 were excluded because they lacked data on assets or sales revenue. This left 862 credit-seeking firms for our analysis.

The variables used to estimate Equation (1) are defined in Table 2. All of them have appeared in one or more of the empirical studies of relationship lending summarized in Table 1.

Of the five variables representing firm attributes, two reflect degree of informational opacity while three reflect default risk. LNFIRMAGE is the log of a respondent firm's age in years; LNSALES is the log of the firm's annual sales revenue in fiscal year 1998. Greater values of both variables should be associated with lesser degrees of informational opacity. The log specification allows the marginal effects of age and size increases to diminish. BUSDELINQ is the number of delinquencies on recent business obligations of a surveyed firm; PROPART_PERDEL is the number of delinquencies on recent personal obligations of the principal owner of a firm organized as either a proprietorship or a partnership. PROPART_PERDEL is included along with BUSDELINQ because the finances of small, non-corporate firms are known to be intertwined with those of their owners (Ang et al. (1995)). RATING is the surveyed firm's Dun and Bradstreet credit rating, which is publicly available information. Increases in BUSDELINQ, PROPART_PERDEL and RATING are associated with greater loan default risk.[11] [12]

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[10] Certain types of firms were over-sampled in the survey. Thus in order to make inferences about population parameters we weighted the observations in all our empirical work.

[11] Other variables used by prior researchers to characterize firm attributes were included in preliminary empirical work but proved to have little or no explanatory power in this sample. These variables include the log of total assets, the current ratio, quick ratio, several profitability ratios, and several leverage ratios. Adjusting the ratios to reflect differences among industries also proved fruitless.

HHI3_B, a variable based on the Herfindahl index for the commercial bank industry in the MSA or county where the respondent firm is headquartered, gauges competitive conditions of the loan market facing a respondent firm. Higher values of HHI3 imply lesser degrees of competition. Besanko and Thakor (1987), Petersen and Rajan (1995), Boot and Thakor (2000) all present theoretical models showing that lenders exhibit different behavior depending upon the competitiveness of the loan market.

Five variables represent loan contract characteristics. ACCEPTED and SECURED are zero-one binary variables indicating whether a surveyed firm's most recent loan application was accepted and, if so, whether it required collateral or a guarantee. SPREAD is the interest rate on the firm's most recent loan less the prime rate prevailing when the loan was granted. LNAMOUNT and LNMATURITY are included to control for the size of the loan requested on a firm's most recent loan application and the original term to maturity on the loan if the application was accepted.

Four variables characterize lender-borrower relationships. LNLENGTH is the log of the length of the business relationship between a firm and the lender most recently applied to; NOPRINFO is a zero-one binary variable coded one if there is no prior relationship. Including both LNLENGTH and NOPRINFO in Equation (1) allows for differences in lender behavior before the start of a relationship, when a firm is most informationally opaque to the lender, and after the initiation of a relationship, when the firm has become more transparent. NUMOLOANSOURCES, the number of lenders besides the lender applied to, is included to proxy the quality and exclusivity of the lender's private information about the firm as well as the presence of possible free-rider problems. PRIMEFI, a zero-one binary variable, indicates whether the lender applied to is the firm's primary financial institution. PRIMEFI proxies relationship depth.[13]

Table 3 presents summary statistics for the variables listed in Table 2. Sample means and standard errors are reported for all loan applications, for line-of-credit loan applications, and for traditional loan applications. T-tests for differences in the variable means for line-of-credit applications and traditional loan applications are also shown.

Firms that applied for line-of-credit and traditional loans show both similarities and differences in characteristics. The sampled firms average 8.7 years in age and just under $290,000 in annual sales. Firms that applied for traditional loans average one-third year older and $60,000 more in annual sales than credit-line applicants. Loan applicants show no difference in their proclivity for loan default: the sample means of BUSDELINQ, PROPART_PERDEL and RATING for line-of-credit and traditional loans are statistically indistinguishable. In addition, applicants for both loans types faced loan markets characterized by similar degrees of competition: the means for HHI3_B are statistically identical.

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[12] Also included among the explanatory variables in every model estimated were three binary variables to control for the surveyed firm's organizational form (partnership, S-corporation or C-corporation) and eight binary variables to control for the firm's industry based on the firm's 2-digit SIC code (construction and mining, primary manufacturing, other manufacturing, transportation, wholesale trade, retail trade, insurance and real estate, business services and professional services). Because the coefficient estimates of these variables achieved statistical significance only rarely, none of them are reported in the subsequent tables.

[13] All seven studies summarized in Table 1 included a variable similar to LNLENGTH in their models. Cole (1998) uses a variable like NOPRINFO. Petersen and Rajan (1994), Cole (1998) and Harhoff and Körting (1998) include a variable analogous to NUMOLOANSOURCES. Elsas and Krahnen (1998), Angelini et at. (1998) and Degryse and van Cayseele (2000) include a variable analogous to PRIMEFI.

The contract characteristics of line-of-credit and traditional loans granted to the respondent firms differ in several respects. Applications for traditional loans were accepted more often and were accepted for larger amounts than applications for credit lines (86% versus 65%, and $36,000 versus $27,000, respectively). Accepted traditional loans also had greater average original terms to maturity (just over 3 years versus almost ten months). Not surprisingly lenders more often required security on traditional loans than line-of-credit loans; but the relative proportions are, perhaps, surprising: 82% of traditional loans versus 67% of line-of-credit loans. The similarity in the two proportions calls into question the claim that line-of-credit loans are pure relationship loans whereas traditional loans are pure asset-based loans (cf., Berger and Udell 2002): the difference between the two loan types may be more one of degree than of kind. In addition, the significant number of unsecured traditional loans contravenes one of the two premises for the presumed irrelevance of relationships to traditional loans, namely that collateral protects lenders from default risk and removes the need to overcome information asymmetries through relationships. The other premise, that firms financing large, infrequent capital expenditures are chiefly concerned with getting the lowest possible interest rate, is neither confirmed nor refuted by the data: the average interest rate spread above prime is statistically identical between accepted line-of-credit loans and traditional loans.

Finally, the sample statistics show that firms that applied for line-of-credit and traditional loans are more alike than different in their relationships with the lenders they applied to. Specifically, applicants for both loan types had no prior relationship with about one-quarter of the FIs they applied to, and applicants for both loan types averaged slightly more than one other lender besides the lender applied to in the survey. In addition, 51% of the applicants for both loan types reported that the FI they applied to was their primary FI. Only the average relationship length differs statistically between firms that applied for line-of-credit and traditional loans (13 months versus 19 months, respectively).

To elucidate relationships among the variables we present a matrix of Pearson correlation coefficients in Table 4. The correlations are generally quite low, with all but 21 of the 105 correlations lying between -0.20 and +0.20, and all but 8 lying between -0.30 and +0.30. LNSALES is moderately correlated with PROPART_PERDEL and LNAMOUNT (-0.405 and 0.572 respectively) and the relationship variables NOPRINFO, LNLENGTH and PRIMEFI exhibit moderate degrees for correlation.

III. Empirical Results

III.A. Results from Estimated Models of Credit Availability

To study the impact of pre-existing relationships on credit availability we follow Cole (1998) and use logistic regression to estimate models having the form[14]:

Probability(a loan application is accepted)
= f (firm attributes, market attributes,
loan contract attributes, lender-borrower relationship attributes)
+ error term, (2)

Although testing for relationship effects on credit availability may seem superfluous given data to test for relationship effects on security and lending rates, the latter tests are actually joint tests

[14] We choose the approach of Cole (1998) over that of Petersen and Rajan (1994) because it is affords a more direct test of the effect of relationships on credit availability. Data availability prevents us from using the approach of Angelini et al. (1998).

of whether (i) lenders use relationships to gather valuable private information about informationally opaque borrower firms; (ii) lenders use this information to adjust loan terms and prices; and (iii) the adjustments are discernible in the data.[15] But in a world with equilibrium credit rationing, relationships might well affect the availability of credit without affecting the terms or price of credit (i.e., (i) occurs but (ii) and (iii) do not). If so, the coefficients of the relationship variables will tend towards statistical significance in estimated models of credit availability but not in estimated models of security or loan rate. Conversely should (i), (ii) and (iii) occur the coefficients of the relationship variables will tend towards statistical significance in all three estimated models and estimated models of credit availability will, though redundant, provide an additional check on the robustness of the other model estimates.

In preparation for estimating Equation (2) we stratified the sample of 862 loan applications into sub-samples of approved and rejected applications and then further stratified the applications into sub-samples of approved and rejected line-of-credit applications and approved and rejected traditional bank loan applications.

To gain insight into the data before estimating Equation (2) we used the data to compute summary statistics for the equation's independent variables. Table 5 reports statistics for all loan applications (Panel A), for line-of-credit applications (Panel B), and for traditional loan applications (Panel C). In each panel statistics for approved and rejected loan applications appear in Columns 2 and 3, respectively. Column 4 reports t-tests of the hypothesis of identical sample means for approved and rejected applications.[16]

The statistics reveal both similarities and differences in the firm, loan market, and contract attributes of approved and denied loan applications. Compared with denied applications, approved applications came from firms averaging greater age, greater annual sales, fewer delinquent payments, and better public credit ratings. The same statement holds for the sub-samples of line-of-credit and traditional loan applications, except that average firm age is statistically identical in the sub-samples of approved and denied line-of-credit loan applications. Successful applicants for all loans and for traditional loans were headquartered in more competitive banking markets than unsuccessful applicants, on average, but average banking market competitiveness was statistically indistinguishable in the markets where successful and unsuccessful line-of-credit applicants were headquartered. Approved line-of-credit applications asked for larger loans than denied applications, on average, though the average amounts requested on traditional loan applications approved and denied are statistically identical. A similar statement applies for all loan applications.

The statistics also show similarities and differences in the lender-borrower relationship attributes of successful and unsuccessful loan applicants. Compared with unsuccessful applicants, successful applicants applied more frequently to their primary FIs and less frequently to FIs with whom they had no prior relationship; this statement applies to all loans, to lines-of-credit, and to traditional loans. Successful applicants also averaged longer prior relationships with the FIs they applied to than unsuccessful applicants (18 months versus 13 months). The difference in average relationship length is slightly greater for traditional loan applicants than for all loan applicants (20 months versus 13 months), but is indistinguishable from zero for successful and unsuccessful line-of-credit applicants (about 13 months). Also, successful and

[15] This reasoning is due to Berger and Udell (1995).

[16] No statistics are reported for the contract characteristic variables LNMATURITY, SECURED or SPREAD as data for these variables were only available for accepted loan applications. The variable ACCEPTED is reflected in the approved / denied dichotomization.

unsuccessful loan applicants showed no statistical difference in the average number of other loan sources to which they had access.

Table 6 reports estimates of Equation (2) produced using logistic regression. In all, six model estimates are reported: two estimated on data for all loan applications, two estimated on data for line-of-credit loan applications only, and two estimated on data for traditional loan applications only. The first estimate in each pair is an estimate of a restricted version of Equation (2) that omits the relationship explanatory variables; the second of each pair is an estimate of the full model.

Looking first at the restricted models, the estimates generally confirm the patterns reported in Table 5. The model estimates show an application's acceptance probability improves significantly with increases in firm age and annual sales volume and diminishes significantly with increases in delinquent payments by either the firm or the firm's principal owner. Interestingly RATING, the publicly-available measure of credit worthiness, fails to achieve statistical significance in any model estimate, a result consistent with lenders using privately available information gathered from relationships to make loan decisions on informationally opaque firms. As expected from Table 5, increasing lender market competition increases the probability of loan acceptance for all loans and for traditional loans, though not line-of-credit loans (the coefficient estimates of HHI3_B are negative). At variance with the Table 5 statistics are the coefficient estimates of LNAMOUNT: increasing the size of the loan applied for significantly reduces an application's acceptance probability for all loans and for traditional loans, though not for line-of-credit loans.

Adding the relationship variables to the restricted model and re-estimating has little effect on the coefficient estimates of the non-relationship variables. This is unsurprising, given the generally low Pearson correlation coefficients reported in Table 4. The coefficient estimates of LNFIRMAGE and HHI3_B become larger in absolute value and gain in statistical significance in all three model estimates but especially in the model estimates for line-of-credit loan applications.

Estimates of the full model confirm the importance of relationships to the availability of credit for both line-of-credit loans and traditional loans. The probability of loan acceptance declines when a firm applies to lenders with whom it has no prior relationship, but increases when it applies to its primary FI (the coefficient estimates of NOPRIFNO and PRIMEFI are significantly negative and positive, respectively). This result holds for all loan applications, line-of-credit applications and traditional loan applications, although the coefficient estimates are smaller in absolute value and statistically less significant in the model estimated for traditional loan applications. The enhanced probability of loan acceptance when a firm applies to its primary FI is consistent with the reputation enhancement view and hypothesis H3. However, longer relationships reduce the probability of loan acceptance in all three model estimates (the coefficient estimates of LNLENGTH are all significantly negative), a result consistent with the information capture view and hypothesis H4. Among the relationship explanatory variables only NUMOLOANSOURCES fails to have much impact on credit availability. [17]

[17] Predicted to be negatively related to the probability of loan acceptance, the coefficient estimate of NUMOLOANSOURCES is statistically insignificant in the equation for all loan applications, negative but insignificant at the 10% level in the equation for all traditional loan applications, and positive and significant at the 10% level in the equation for line-of-credit loan applications. The positive coefficient estimate in the last equation might represent a certification effect whereby loans from other lenders signal a high-quality project to the lender applied to, raising the probability of loan acceptance.

Chi-square tests of the hypothesis that the estimated coefficients of the relationship variables are jointly zero add further evidence to the importance of relationships to the availability of both line-of-credit loans and traditional loans. The test statistics, reported at the bottom of Table 6, show rejection of the hypothesis at the 1% level for all loan applications, line-of-credit applications and traditional loan applications. These results support H1 over H2. Traditional loans and line-of-credit loans are both relationship loans.

III.B. Results from Estimated Models of Security

To study the impact of pre-existing relationships on the security lenders require we follow Berger and Udell (1995) and Degryse and van Cayseele (2000) and use logistic regression to estimate models having the form:[18]

Probability(a lender requires collateral or a guarantee)
= f (firm attributes, market attributes,
loan contract attributes, lender-borrower relationship attributes)
+ error term, (3)

In our sample of 862 loan applications, data about lenders' security requirements are available only for the 703 applications lenders approved. In preparing to estimate Equation (3) we stratified these observations into sub-samples of secured and unsecured loans, and then further stratified the sub-samples according to whether the loans were line-of-credit loans or traditional loans.

To get an understanding of the data before estimating Equation (3) we used the data to compute summary statistics for the equation's independent variables. We report the results in Table 7. Panels A, B and C report summary statistics for all loans, for line-of-credit loans, and for traditional loans, respectively. In every panel columns 2 and 3 report statistics for secured and unsecured loans, respectively, and column 4 reports t-tests of the hypothesis that the sample means are identical for secured and unsecured loans.[19]

The data reveal subtle differences in the characteristics of firms granted secured and unsecured loans. Although firms required to secure their loans have the same average age as firms that were not, they have higher average annual sales. While this latter result seems counterintuitive, it probably reflects the moderately positive correlation between annual sales and loan amount.[20] Compared with firms granted unsecured loans, those granted secured loans averaged more business delinquencies, implying that lenders require security from firms with observably greater risk (cf. Berger and Udell (1990)). Firms with secured traditional loans average significantly higher Dun and Bradstreet risk ratings than firms with unsecured traditional loans, but the average risk ratings for secured and unsecured line-of-credit loans is statistically identical. Curiously, proprietorships and partnerships with secured loans averaged fewer personal delinquencies than their counterparts with unsecured loans, but the difference is statistically significant only for traditional loans. Fewer personal delinquencies for firms with secured loans is indicative of signaling behavior described by Bester (1985) and Besanko and Thakor (1987).

The Table 7 statistics show firms granted secured and unsecured loans faced loan markets having similar competitive conditions: the average degree of banking market concentration is

[18] Harhoff and Körting (1998) use probit regression to estimate a model similar to Equation (2).

[19] No statistics are reported for the contract characteristic variable ACCEPTED as all these applications were accepted. The variable SECURED is reflected in the secured / unsecured dichotomization.

[20] Table 4 shows that the Pearson correlation coefficient between LNSALES and LNAMOUNT is +0.572.

statistically identical for firms with secured and unsecured loans at the 10% level. Banking market concentration is nearly greater for firms with lines of credit that are secured rather than unsecured: the difference just misses statistically significance at the 10% level.

The summary statistics exhibit distinct differences in the contract characteristics of secured and unsecured loans. Compared with unsecured loans, secured loans average significantly larger loan amounts and significantly greater maturities. This statement applies to all loans, to line-of-credit loans and to traditional loans.

The statistics also show that secured and unsecured loans differ significantly in their average relationship attributes. Compared with unsecured loans, secured loans averaged shorter relationship lengths, greater frequency of no prior relationships, less exclusive relationships, and greater frequency of tangential relationships. These statements apply to all loans, to traditional loans, and to line-of-credit loans, except that secured and unsecured line-of-credit loans do not differ statistically in their average frequencies of no prior relationships and tangential relationships.

Table 8 reports estimates of Equation (3) produced using logistic regression. In all, six model estimates are reported: two estimated on data for all accepted loans, two estimated on data for all accepted line-of-credit loans, and two estimated for all accepted traditional loans. The first estimate in each pair is an estimate of a restricted version of Equation (3) that omits the relationship explanatory variables; the second of each pair is an estimate of the full model.

Looking first at the restricted models, the model estimates suggest differences in the factors influencing the probabilities that line-of-credit and traditional loans will be secured. Increases in a firm's delinquent obligations increases the probability that the firm must secure its traditional loans thought not its line-of-credit loans, whereas increasing the degree of banking market concentration a firm faces increases the probability the firm must secure its line-of-credit loans though not its traditional loans. Greater terms to maturity increase the probability a line-of-credit loan must be secured, though not a traditional loan. The remaining explanatory variables have qualitatively similar effects on the probabilities that line-of-credit and traditional loans will be secured. Specifically, increasing loan amount increases the probability that any loan is secured, whereas increasing a firm's informational opacity, as proxied by LNFIRMAGE and LNSALES, or a firm's publicly available risk ranking, RATING, has no statistical discernible effect on the probability that loans of either type are secured.

Adding the relationship variables to the restricted models has little impact on the coefficient estimates of the non-relationship variables. LNFIRMAGE achieves statistical significance with a negative coefficient in the model for traditional loans, implying falling security requirements as increasing age makes a borrowing firm more informationally transparent to lenders. Otherwise the coefficient estimates of the non-relationship variables remain virtually unchanged.

Estimates of the full model confirm the importance of relationships to the security requirements of both line-of-credit and traditional loans, in addition to confirming differences in the effects of relationships on security requirements across the two loans types. The estimated model for line-of-credit loans shows that the probability of a secured loan increases with declining exclusivity of the lender-borrower relationship (the estimated coefficient of NUMOLOANSOURCES is negatively signed). The other relationship variables have no discernible impact on the probability that a line-of-credit loan will be secured, however. In contrast, the estimated model for traditional loans shows the probability of a secured loan to increase with no prior information about the borrower or with a longer-lived lender-borrower relationship (the coefficient estimates of NOPRINFO and LNLENGTH are both positive). The former result implies lenders protect themselves against unknown informationally opaque

borrowers by increasing the probability they require security, whereas the latter result is consistent with lenders using relationships to learn about assets available to serve as collateral, as per the information capture view (H4).

Chi-square tests of the hypothesis that the estimated coefficients of the relationship variables are jointly zero in estimates of the full model further support the importance of relationships to decisions about security for both line-of-credit loans and traditional loans. The test statistics, reported at the bottom of Table 8, show rejection of the hypothesis at the 5% level for line-of-credit loans, and rejection at the 1% level for all traditional loans as well as all loans. Thus like the models of credit availability seen earlier, the chi-square tests for the models of loan security support H1 over H2. Traditional loans, like lines of credit, are relationship loans.

III. C. Results from Estimated Models of Interest Rate Spreads

To study the impact of pre-existing relationships on the spread over prime required by the lender we follow Berger and Udell (1995), Blackwell and Winters (1997), Elsas and Krahnen (1998) and Bodenhorn (2003). We estimate the following model of the loan rate premium over prime using the method of ordinary least squares:[21]

Interest rate spread over prime

$$= \beta_0 + \beta_1 \text{ firm attributes} + \beta_2 \text{ market attributes} + \beta_3 \text{ loan contract attributes} + \beta_4 \text{ lender-borrower relationship attributes} + \text{error term} \quad (4)$$

Table 9 reports estimates of Equation (4) produced using data for the 703 sample loan applications that were accepted, the applications for which loan rate data were available. In all, six model estimates are reported: two estimated on data for all loans, two estimated on data for line-of-credit loans, and estimated on data for traditional loans. The first estimate in each pair is an estimate of a restricted version of Equation (4) that omits the relationship explanatory variables; the second of each pair is an estimate of the full model.

Estimates of the restricted models fit the data poorly. The adjusted R^2 is highest for the model estimated on traditional loan data ($R^2 = 0.137$) and lowest for the model estimated on line-of-credit data ($R^2 = 0.074$). The explanatory variables proxying firm characteristics achieve statistical significance sporadically. Increasing firm age or sales revenue -- indicative of greater informational transparency -- significantly reduces the spread paid on traditional loans but not line-of-credit loans. Increasing delinquencies on business obligations significantly increases the spread paid on line-of-credit loans, though not traditional loans. Curiously, higher public risk ratings reduce the spread paid on line-of-credit loans, a result that cannot be readily explained.[22] The explanatory variables proxying contract characteristics exhibit the most consistent impact on spread. Larger loans significantly reduce the spread paid on both line-of-credit loans and traditional loans, while increasing loan term significantly reduces the spread paid for traditional loans. Both results are consistent with loan pricing to reflect falling administrative costs per

[21] Petersen and Rajan (1994), Harhoff and Körting (1998), Angelini et al. (1998) and Degryse and van Cayseele (2000) also estimate models similar to Equation (4) except that the dependent variable is the loan rate rather than the spread.

[22] While a lender with more accurate private information about a firm's risk characteristics might well be expected to reduce his loan rate, the negative coefficient estimate of RATING implies that public ratings consistently overstate borrower risk.

dollar lent. The spreads paid on secured and unsecured loans are statistically indistinguishable, both for line-of-credit and traditional loans.

Adding the relationship variables to the restricted models and re-estimating improves somewhat the fit of the estimated models while having little impact on the coefficient estimates of the non-relationships variables. The coefficient estimates of LNFIRMAGE, BUSDELINQ and LNSALES decline somewhat in absolute value and lose statistical significance in the estimated models for all loans, line-of-credit loans and traditional loans, respectively. But the estimated coefficients of the remaining non-relationship variables are virtually unaffected.

Although estimates of the full model better fit the data than estimates of the restricted model regardless of whether the models are estimated using observations on all loans, line-of-credit loans or traditional loans, the relationship explanatory variables contribute almost no statistically significant coefficients to the estimated full models. The estimated coefficients of NOPRINFO, NUMOLOANSOURCES and PRIMEFI fail to approach statistical significance in any of the three models estimates. Only the estimated coefficients of LNLENGTH provide some evidence favorable to the importance of lender-borrower relationships, albeit weak evidence. Consistent with the reputation enhancement view, the estimated coefficients of LNLENGTH are all negatively signed. The estimated coefficient of LNLENGTH achieves statistical significance in the model estimated on data for all loans, but narrowly misses significance at the 10% level in the models estimated for line-of-credit loans and traditional loans.

The failure of relationship explanatory variables to exhibit measurable effects on loan rates is not new: Petersen and Rajan (1994), Harhoff and Körting (1998), and Elsas and Krahnen (1998) report similar results, as do Berger and Udell (1995) for sample firms with below-median assets. But before concluding that relationships exerted no significant impact on the loan pricing decisions of lenders in our sample, we explore two other possibilities.

First, we consider the possibility that in our sample correlations among the relationship variables prevent these variables from exhibiting measurable influences on the spread in models estimated using the OLS technique. The large (in absolute value) correlation coefficients among the relationship variables reported in Table 4 lend credence to this possibility. To assess whether multicollinearity might account for the relationship variables' statistically insignificant coefficient estimates, we performed F-tests of the hypothesis that the coefficient estimates of the relationship variables are jointly zero. The F-statistics, reported at the bottom of Table 9, soundly reject this hypothesis at conventional significance levels for the models estimated on data for all loans, for line-of-credit loans, and for traditional loans. Thus, relationships appear to influence loan pricing decisions for both credit lines and traditional loans despite statistically insignificant estimated coefficients for the relationship variables in estimates of the full model.

Second, following Berger and Udell (1995), we consider the possibility that the pricing of bank loans to very small firms is so idiosyncratic as to mask the explanatory power of even highly significant loan pricing determinants in models estimated on data for small and large firms. Similar to Berger and Udell we re-estimate Equation (4) on data for firms with assets above and below $364,000, the median for our sample. We report these results in Table 10. In all, six estimates of (4) are reported: two estimated using observations on both line-of-credit and traditional loan applications, two estimated using observations on line-of-credit applications, and two estimated using observations on traditional loan applications. In each pair the estimate on the left was produced using observations only on firms having above-median assets, while the estimate on the right was produced using only observations on firms having below-median assets.

The estimates of (4) reported in Table 10 support the claim of idiosyncratic loan pricing for very small firms, but chiefly in the pricing of line-of-credit loans. Estimates of (4) produced

using observations on the above-asset-median firms consistently fit the data better than those produced using observations on the below-asset-median firms, judged by the adjusted R^2s. However, the fit difference is substantial only for line-of-credit loans (adjusted R^2s of 0.596 vs. –0.058 for line-of-credit loans, compared with adjusted R^2s of 0.149 vs. 0.058 for all loans and 0.156 vs. 0.117 for traditional loans). For line-of-credit loans, the improved fit achieved by excluding observations on below-asset-median firms is accompanied by substantial changes in the estimated coefficients of PROPART_PERDEL, LNFIRMAGE, RATING and, to a lesser extent, LNMATURITY and SECURED: they all change their algebraic signs and achieve or approach statistical significance. In contrast, estimating (4) using observations on line-of-credit loan applications from below-asset-median firms yields coefficient estimates of all the explanatory variables little different than those produced by estimating (4) using observations on line-of-credit loan applications from firms of all sizes.

The Table 10 results also weaken the case for significant relationship effects in the pricing of line-of-credit loans, but strengthen this case in the pricing of traditional loans. In the two estimated models for line-of-credit loans, none of the coefficient estimates of the relationship variables achieves statistical significance. Moreover, F-tests of the hypothesis that the estimated coefficients of the relationship variables are jointly zero, reported at the bottom of Table 10, fail to reject the null for both estimated models for line-of-credit loans. Thus in our sample, lender-borrower relationships do not appear to have consistent, significant impacts on the pricing of line-of-credit loans.

The irrelevance of relationships to the pricing of line-of-credit loans does not apply to the pricing of traditional loans. In the two estimated models for traditional loans reported in Table 10, the estimated coefficients of the relationship variables LNLENGTH, NOPRINFO and NUMOLOANSOURCES all have the predicted algebraic signs, though only the estimated coefficient of NUMOLOANSOURCES achieves statistical significance, and then only in the model estimated for firms with above-median assets. The coefficient estimate of the fourth relationship variable, PRIMEFI, is positively signed in the estimated model for larger firms -- consistent with the information capture view (H4) -- but negatively signed in the estimated model for smaller firms -- consistent with the reputation enhancement view (H3). The estimated coefficient of PRIMEFI achieves statistical significance in the model estimated for larger firms but not for smaller firms. Nevertheless, F-tests of the hypothesis that the estimated coefficients of the four relationship variables are jointly zero is rejected by the data for firms with above- and below-median assets. Thus, lender-borrower relationships appear to have consistent, significant impacts on the pricing of traditional loans in our sample. This result supports H1 over H2. Traditional loans have a stronger claim to being relationships loans than line-of-credit loans, judging from our results.

IV. Summary and Conclusion

Lender-borrower relationships potentially affect small businesses' access to funds by affecting the availability of credit, the security they must offer to get credit, and the price of credit. Theorists have presented competing views of how relationships might affect small businesses' access to funds, here referred to as the reputation enhancement and information capture views. Previous empirical studies of relationships' impacts on small businesses' credit market access use data on lines of credit on grounds that lines of credit are, by their design, relationship loans.

This study has investigated the influence of lender-borrower relationships on such traditional small business loans as mortgages, equipment loans and motor vehicle loans, in addition to lines of credit. While traditional loans may entail looser lender-borrower relationships

because they finance one-time, non-recurring credit needs and provide their own collateral, we argued that traditional loans are potentially relationship loans due to information asymmetries that arise because small businesses are informationally opaque. We framed our argument in the form of competing hypotheses: H1, traditional loans are relationship loans, vs. H2, traditional loans are transaction (non-relationship) loans. We investigated empirically the impact of relationships on small businesses' access to credit by investigating relationships' impacts on the availability, required security, and price of traditional loans and credit lines. We also investigated whether the evidence better supported the reputation enhancement or information capture views, again framing this investigation in terms of competing hypotheses: H3, relationships evolve as per the reputation enhancement view, vs. H4, relationships evolve as per the information capture view.

Our empirical evidence clearly supports hypothesis H1 and more consistently supports hypothesis H4 than H3. Test statistics from estimated logistic regression models of the probability that a lender grants a small business a loan show that relationship variables affect acceptance probabilities for both credit lines and traditional loans. Likewise, test statistics from estimated logistic regression models of the probability that a lender requires security from a small business show that the relationship variables affect the probabilities of both credit lines and traditional loans. Finally, test statistics from estimated ordinary least squares regression models of the spread between the prime rate and the loan rate show that relationship variables contribute significant explanatory power in the models for traditional loans but not in the models for credit lines. Throughout our empirical work evidence consistent with both H3 and H4 is found, but support for H4 is more consistent. We conclude that traditional loans are indeed relationship loans and that credit availability and terms evolve more nearly as described by the information capture view.

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Table I
Summary of Empirical Studies

Authors	Data	Effect of Relationships on			View evidence supports
		Availability of Credit	Collateral Requirements	Lending Rate	
Petersen & Rajan (1994)	1988-89 NSSBF, all loan types	improves	n.a.	no effect	ambiguous
Berger & Udell (1995)	1988-89 NSSBF, bank lines of credit	n.a.	less required for larger firms	lower for larger firms, no effect for smaller firms	reputation enhancement
Blackwell & Winters (1997)	proprietary sample of bank lines of credit to small US businesses	n.a.	n.a.	lower	reputation enhancement
Cole (1998)	1993 NSSBF, all loan types	improves	n.a.	n.a.	ambiguous
Harhoff and Körting (1998)	proprietary survey of 1509 German small business line of credit loans	no effect	less required	no effect	reputation enhancement / ambiguous
Elsas and Krahnen (1998)	proprietary survey of loans to medium-size German firms by 5 German banks; line of credit loans	n.a.	n.a.	no effect	ambiguous
Angelini et al. (1998)	proprietary sample of small Italian firms; interest rates line-of-credit loans	improves	n.a.	higher	information capture
Degryse and van Cayseele (2000)	proprietary sample of bank loans to small Belgian firms; non-line-of-credit loans	n.a.	more required	higher	information capture

Table II
Variable Names and Descriptions

Variable Name	Description
Firm Characteristics	
LNFIRMAGE	Log of the number of years the firm has been owned by its current owners.
LNSALES	Log of total annual sales in fiscal year 1998.
BUSDELINQ	Number of business obligations on which the firm has been 60 days or more delinquent in the past 3 years.
PROPART_PERDEL	For firms organized as proprietorships and partnerships, number of personal obligations on which the firm's principal owner has been 60 days or more delinquent in the past 3 years; zero otherwise.
RATING	Firm's Dun and Bradstreet score, coded 1 (lowest risk), 2,3,4, or 5 (highest risk).
Market Characteristics	
HHI3_B	Scale based on the Herfindahl index for commercial banks in the MSA or county where the firm is headquartered, coded 1 (most competitive), 2, or 3 (most concentrated).
Contract Characteristics	
ACCEPTED	=1 if the firm's more recent loan application was accepted; =0 otherwise.
SECURED	=1 if the firm's most recent loan is secured by collateral or a guarantor; =0 otherwise.
SPREAD	The interest rate on the firm's most recent loan less the prime lending rate prevailing when the loan was made, in percent.
LNAMOUNT	Log of the dollar amount of the loan most recently applied for.
LNMATURITY	Log of the number of months over which the firm's most recent loan is to be repaid.
Relationship Variables	
LNLENGTH	Relationship length between a firm and the lender most recently applied to, measured as the log of one-plus-months-of-relationship.
NOPRINFO	=1 if a firm had no prior relationship with the lender it applied to for its most recent loan; =0 otherwise.
NUMOLOANSOURCES	Number of lenders to a firm besides the lender most recently applied to.
PRIMEFI	=1 if the lender most recently applied to is the firm's primary financial institution; =0 otherwise.

Note: All models estimated also included three binary variables to control for the borrowing firm's organizational form (partnership, S-corporation or C-corporation) and eight binary variables to control for the firm's industry based on the firm's 2-digit SIC code (construction and mining, primary manufacturing, other manufacturing, transportation, wholesale trade, retail trade, insurance and real estate, business services and professional services).

Table III
Summary Statistics for All Loans Applications, Line-of-Credit Loan Applications and Traditional Loan Applications

The variables listed in Column 1 correspond to the variables defined in Table 2. For every variable in Column 1 summary statistics are reported for all loans (Column 2), for line-of-credit loans (Column 3) and for traditional loans (Column 4). Column 5 presents t-tests of the hypothesis that the means for line-of-credit and traditional loan applications are identical. Column 5a shows t-statistics and Column 5b the associated p-values. Sample means statistically different at the 1%, 5% and 10% levels are designated ***, ** and *, respectively.

(1)			(2)		(3)		(4)		(5)	
Variable	all loans		All Applications		Line-of-Credit Loan Applications		Traditional Loan Applications		t tests	
			(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
	Mean	**Std Error**	Mean	Std Error	Mean	Std Error	Mean	Std Error	t	p-value
Firm Characteristics										
LNFIRMAGE	2.16	0.03	2.16	0.03	2.08	0.05	2.20	0.03	-2.08**	0.04
LNSALES	12.57	0.06	12.57	0.06	12.24	0.11	12.76	0.07	-4.15***	<0.01
BUSDELINQ	1.50	0.04	1.50	0.04	1.56	0.06	1.48	0.04	1.08	0.28
PROPART_PERDEL	0.76	0.04	0.76	0.04	0.76	0.06	0.76	0.05	-0.09	0.93
RATING	2.49	0.02	3.04	0.04	3.10	0.06	3.00	0.05	1.36	0.18
Market Characteristics										
HHI3_B			2.49	0.02	2.51	0.03	2.48	0.02	0.70	0.48
Contract Characteristics										
ACCEPTED	3.04	0.04	0.78	0.01	0.65	0.03	0.86	0.01	-7.61***	<0.01
LNAMOUNT	10.38	0.06	10.38	0.06	10.20	0.11	10.48	0.06	-2.44**	0.02
LNMATURITY[1]			3.22	0.06	2.29	0.11	3.61	0.06	-11.55***	<0.01
SECURED[1]			0.78	0.02	0.67	0.03	0.82	0.02	-4.50***	<0.01
SPREAD[1]			1.01	0.09	1.17	0.19	0.94	0.10	1.17	0.24
Relationship Variables										
LNLENGTH	2.80	0.07	2.80	0.07	2.59	0.11	2.92	0.09	-2.31**	0.02
NOPRINFO	0.27	0.02	0.27	0.02	0.29	0.03	0.25	0.02	1.17	0.24
NUMOLOANSOURCES	1.10	0.05	1.10	0.05	1.11	0.08	1.10	0.06	0.15	0.88
PRIMEFI	0.51	0.02	0.51	0.02	0.51	0.03	0.51	0.02	0.05	0.96
Number of Loans			862		302		560			

[1] Data for LNMATURITY, SECURED and SPREAD are available only for accepted loans. 703 of the 862 sample loans were accepted, of which 213 were line-of-credit loans and 490 were traditional loans.

Table IV
Correlation Matrix

Table V
Summary Statistics for Accepted and Rejected Loan Applications

Panel A: All Loan Applications								
(1)			(2)		(3)		(4)	
Variable	all loans		Approved		Denied		t tests	
			(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
	Mean	Std Error	Mean	Std Error	Mean	Std Error	t	p-value
Firm Characteristics								
LNFIRMAGE	2.16	0.03	2.22	0.03	1.93	0.06	4.39***	<0.01
LNSALES	12.57	0.06	12.80	0.07	11.75	0.14	7.21***	<0.01
BUSDELINQ	1.50	0.04	1.36	0.03	2.01	0.10	-7.74***	<0.01
PROPART_PERDEL	0.76	0.04	0.59	0.03	1.38	0.12	-9.19***	<0.01
RATING	2.49	0.02	2.97	0.04	3.29	0.08	-3.63***	<0.01
Market Characteristics								
HHI3_B	3.04	0.04	2.47	0.02	2.56	0.04	-1.86*	0.06
Contract Characteristics [1]								
LNAMOUNT	10.38	0.06	10.42	0.06	10.24	0.13	1.27	0.20
Relationship Variables								
LNLENGTH	2.80	0.07	2.87	0.08	2.53	0.16	2.05**	0.04
NOPRINFO	0.27	0.02	0.24	0.02	0.35	0.04	-2.83***	<0.01
NUMOLOANSOURCES	1.10	0.05	1.12	0.05	1.03	0.10	0.80	0.43
PRIMEFI	0.51	0.02	0.54	0.02	0.40	0.04	3.48***	<0.01
Number of Loans			703		159			

[1] No statistics are reported for the contract characteristic variables LNMATURITY, SECURED or SPREAD as data for these variables were only available for accepted loan applications. The variable ACCEPTED is reflected in the approved / denied dichotomization.

Table V, continued

Panel B: Line-of-Credit Loan Applications

(1) Variable			(2) Approved		(3) Denied		(4) t tests	
			(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
	Mean	Std Error	Mean	Std Error	Mean	Std Error	t	p-value
Firm Characteristics								
LNFIRMAGE	2.08	0.05	2.13	0.05	1.99	0.09	1.42	0.16
LNSALES	12.24	0.11	12.53	0.14	11.70	0.19	3.51***	<0.01
BUSDELINQ	1.56	0.06	1.28	0.06	2.05	0.14	-6.24***	<0.01
PROPART_PERDEL	0.76	0.06	0.50	0.04	1.21	0.16	-5.80***	<0.01
RATING	2.51	0.03	3.00	0.07	3.29	0.10	-2.39**	0.02
Market Characteristics								
HHI3_B	3.10	0.06	2.50	0.04	2.53	0.05	-0.41	0.68
Contract Characteristics								
LNAMOUNT	10.20	0.11	10.36	0.13	9.91	0.17	2.02**	0.04
Relationship Variables								
LNLENGTH	2.59	0.11	2.62	0.13	2.52	0.21	0.43	0.67
NOPRINFO	0.29	0.03	0.26	0.03	0.35	0.05	-1.68*	0.09
NUMOLOANSOURCES	1.11	0.08	1.17	0.09	1.01	0.14	1.05	0.29
PRIMEFI	0.51	0.03	0.56	0.03	0.43	0.05	2.21**	0.03
Number of Loans			213		89			

Table V, continued

Panel C: Traditional Loan Applications

(1) Variable			(2) Approved		(3) Denied		(4) t tests	
			(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
	Mean	Std Error	Mean	Std Error	Mean	Std Error	t	p-value
Firm Characteristics								
LNFIRMAGE	2.20	0.03	2.26	0.04	1.83	0.09	4.31***	<0.01
LNSALES	12.76	0.07	12.92	0.07	11.82	0.19	5.48***	<0.01
BUSDELINQ	1.48	0.04	1.40	0.04	1.96	0.15	-4.52***	<0.01
PROPART_PERDEL	0.76	0.05	0.62	0.04	1.63	0.19	-7.78***	<0.01
RATING	2.48	0.02	2.95	0.05	3.29	0.13	-2.48***	0.01
Market Characteristics								
HHI3_B	3.00	0.05	2.46	0.03	2.61	0.06	-2.06**	0.04
Contract Characteristics								
LNAMOUNT	10.48	0.06	10.44	0.07	10.73	0.18	-1.53	0.13
Relationship Variables								
LNLENGTH	2.92	0.09	2.98	0.09	2.54	0.25	1.74*	0.08
NOPRINFO	0.25	0.02	0.24	0.02	0.34	0.06	-2.00**	0.05
NUMOLOANSOURCES	1.10	0.06	1.10	0.07	1.07	0.14	0.18	0.86
PRIMEFI	0.51	0.02	0.54	0.02	0.36	0.06	2.89***	<0.01
Number of Loans			490		70			

Table VI
Estimated Models of Credit Availability

Table VII
Summary Statistics for Secured and Unsecured Loans

Panel A: All Loans

(1) Variable	all loans		(2) Secured		(3) Unsecured		(4) t tests	
			(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
	Mean	Std Error	Mean	Std Error	Mean	Std Error	t	p-value
Firm Characteristics								
LNFIRMAGE	2.16	0.03	2.22	0.03	2.24	0.07	-0.27	0.79
LNSALES	12.57	0.06	13.01	0.07	12.06	0.14	6.04***	<0.01
BUSDELINQ	1.50	0.04	1.44	0.04	1.10	0.05	4.11***	<0.01
PROPART_PERDEL	0.76	0.04	0.56	0.04	0.68	0.05	-1.46	0.14
RATING	2.49	0.02	3.01	0.05	2.81	0.09	2.06**	0.04
Market Characteristics								
HHI3_B	3.04	0.04	2.48	0.02	2.46	0.05	0.38	0.70
Contract Characteristics [1]								
LNAMOUNT	10.38	0.06	10.66	0.07	9.58	0.14	7.42***	<0.01
LNMATURITY			3.41	0.06	2.53	0.15	6.55***	<0.01
Relationship Variables								
LNLENGTH	2.80	0.07	2.76	0.09	3.28	0.17	-2.86***	<0.01
NOPRINFO	0.27	0.02	0.27	0.02	0.16	0.03	2.83***	<0.01
NUMOLOANSOURCES	1.10	0.05	1.22	0.06	0.80	0.10	3.26***	<0.01
PRIMEFI	0.51	0.02	0.52	0.02	0.62	0.04	-2.18**	0.03
Number of Loans			577		126			

[1] All sample loans are accepted loans. The variable SECURED is reflected in the secured / unsecured dichotomization.

Table VII, continued

Panel B: Line-of-Credit Loans								
(1)		(2)		(3)		(4)		
Variable		Secured		Unsecured		t tests		
		(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	
	Mean	Std Error	Mean	Std Error	Mean	Std Error	t	p-value
Firm Characteristics								
LNFIRMAGE	2.08	0.05	2.10	0.07	2.19	0.09	-0.84	0.40
LNSALES	12.24	0.11	12.86	0.17	11.86	0.21	3.46***	<0.01
BUSDELINQ	1.56	0.06	1.38	0.08	1.08	0.06	2.56***	0.01
PROPART_PERDEL	0.76	0.06	0.48	0.05	0.55	0.07	-0.80	0.42
RATING	2.51	0.03	3.03	0.08	2.94	0.13	0.63	0.53
Market Characteristics								
HHI3_B	3.10	0.06	2.54	0.04	2.41	0.07	1.59	0.11
Contract Characteristics								
LNAMOUNT	10.20	0.11	10.82	0.14	9.41	0.25	5.34***	<0.01
LNMATURITY			2.64	0.12	1.57	0.20	4.75***	<0.01
Relationship Variables								
LNLENGTH	2.59	0.11	2.36	0.16	3.16	0.25	-2.82***	0.01
NOPRINFO	0.29	0.03	0.28	0.04	0.20	0.05	1.24	0.22
NUMOLOANSOURCES	1.11	0.08	1.32	0.11	0.86	0.16	2.41**	0.02
PRIMEFI	0.51	0.03	0.54	0.04	0.60	0.06	-0.77	0.44
Number of Loans			154		59			

Table VII, continued

Panel C: Traditional Loans								
(1)		(2) Secured		(3) Unsecured		(4) t tests		
		(2a)	(2b)	(3a)	(3b)	(4a)		(4b)
	Mean	Std Error	Mean	Std Error	Mean	Std Error	t	p-value
Firm Characteristics								
LNFIRMAGE	2.20	0.03	2.26	0.04	2.27	0.10	-0.12	0.90
LNSALES	12.76	0.07	13.06	0.08	12.23	0.19	4.39***	<0.01
BUSDELINQ	1.48	0.04	1.46	0.05	1.11	0.07	3.04***	<0.01
PROPART_PERDEL	0.76	0.05	0.59	0.05	0.77	0.08	-1.65*	0.10
RATING	2.48	0.02	3.01	0.05	2.70	0.14	2.26**	0.02
Market Characteristics								
HHI3_B	3.00	0.05	2.46	0.03	2.49	0.08	-0.53	0.60
Contract Characteristics								
LNAMOUNT	10.48	0.06	10.60	0.07	9.72	0.16	4.97***	<0.01
LNMATURITY			3.68	0.06	3.30	0.16	2.52***	0.01
Relationship Variables								
LNLENGTH	2.92	0.09	2.89	0.10	3.39	0.23	-2.01**	0.04
NOPRINFO	0.25	0.02	0.26	0.02	0.12	0.04	2.80***	0.01
NUMOLOANSOURCES	1.10	0.06	1.18	0.07	0.75	0.13	2.50***	0.01
PRIMEFI	0.51	0.02	0.51	0.02	0.64	0.06	-2.08**	0.04
Number of Loans			423		67			

Table VIII
Probability of Security

Table IX
Interest Rate Spread

Table X
Interest Rate Spread by Firm Size