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LENDING TO SMALL BUSINESSES: THE ROLE OF LOAN MATURITY IN ADDRESSING INFORMATION PROBLEMS

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Lending to Small Businesses: The Role of Loan Maturity in Addressing Information Problems*

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Abstract

We investigate what determines the maturity of loans to small, informationally opaque businesses. We find that longer maturities are associated with collateral pledges, better financial condition, good credit history, and less informational opacity of the borrower. However, we do not find a positive association between stronger firm-creditor relationships (which can attenuate these information asymmetries) and longer maturities. The evidence suggests that creditors use shorter maturities to induce more frequent renegotiation of contract terms, thus enforcing closer monitoring of more informationally opaque and risky borrowers. Overall, our results are consistent with shorter loan maturities mitigating the consequences of borrower-lender informational asymmetries.

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Abstract

We investigate what determines the maturity of loans to small, informationally opaque businesses. We find that longer maturities are associated with collateral pledges, better financial condition, good credit history, and less informational opacity of the borrower. However, we do not find a positive association between stronger firm-creditor relationships (which can attenuate these information asymmetries) and longer maturities. The evidence suggests that creditors use shorter maturities to induce more frequent renegotiation of contract terms, thus enforcing closer monitoring of more informationally opaque and risky borrowers. Overall, our results are consistent with shorter loan maturities mitigating the consequences of borrower-lender informational asymmetries.

1. Introduction

Private debt markets that provide funds for small businesses are characterized by information and agency problems that arise from the opacity that is typical of these businesses. Financial intermediaries make credit decisions and design loan contract terms on the basis of the firm's financial condition, credit history, the characteristics of the entrepreneur, and the severity of the associated information problems. While recent research on credit availability, credit limits, credit constraints, borrowing costs, and collateral requirements provides many insights about small business finance, the determinants of loan maturity remain largely unexplored.

We use the 1993 National Survey of Small Businesses Finances (NSSBF) to investigate how financial intermediaries determine the maturity of loans to small businesses. We hypothesize that lenders use loan maturity to address information and control problems that arise in small business lending. Specifically, we argue that detailed debt covenants that could reduce moral hazard problems are very costly to write and enforce for such small, informationally opaque businesses. In this context, financial institutions could use shorter term loan contracts to force more frequent renegotiation, gaining flexibility and control when lending to small firms. Thus, we expect that less risky and more informationally transparent firms obtain loans with longer maturities.

Our empirical tests are based on the premises that longer maturities exacerbate the consequences of borrower-lender informational asymmetries (e.g., borrowers are more able to shift risk, or more likely to be in financial distress at the time of repayment) and that lenders have strong bargaining power over the loan contract terms. We empirically examine the association between loan maturity and proxies for publicly available

information/firm's reputation, firm and owner credit history, indicators of firms' financial health, owner characteristics, governance structure, collateral pledges, and the use of personal or third party guarantees. In addition, to the extent that strong firm-creditor relationships generate information about borrowers and attenuate information problems, we also explore whether lenders lengthen maturities to borrowers with whom they have closer ties. Our empirical analysis also distinguishes lines of credit from other loans types, such as capital leases, mortgages, motor vehicle loans, and equipment loans. Lines of credit are arguably more relationship-driven than other loan types (Berger and Udell (1995), Harhoff and Körting (1998)). Thus, any effect of relationships on loan maturity can be stronger for lines of credit. On the other hand, other loan types have longer maturities than lines of credit and tend to be fully collateralized, suggesting that loan maturities may be driven by different factors.

Theoretical research on debt covenants suggests that the strictest terms are generally imposed on the firms with the most credit risk and greatest moral hazard incentives (Berlin and Loeys (1988); Berlin and Mester (1993)). Debt contracts for larger firms generally contain detailed covenants, requiring the borrower to return to the institution to renegotiate these covenants when strategic opportunities arise or when the financial condition of the firm changes (Smith and Warner (1979)). These covenants give the lending institution control over borrowers. In addition, Berlin and Mester (1993) and Park (2002) show that by giving banks the right to renegotiate or call loans if covenants are violated, covenants enhance the flexibility and efficiency of financial contracting. However, small firms such as those surveyed in the NSSBF typically do not have audited financial statements, and thus formal debt covenants linked to financial ratios and the

periodic submission of financial information are costly to write and enforce. In such a context, the literature on debt covenants suggests that lenders have a strong influence on debt maturity, and that they may use shorter-term loan contracts to force more frequent renegotiation and mitigate the problems arising from the informational opacity and risk of small firms. Our main goal is to explore whether observed loan maturities could be explained by this *debt covenant view*.

Observed debt maturities are the result of a bargaining process between lenders and borrowers. We argue that the debt covenant view is more appropriate to interpret the results in our sample of small firms, where lenders have strong bargaining power, and are therefore more likely to use maturity as an instrument to exert control over informationally opaque borrowers. However, in direct contrast with the debt covenant view, theoretical research relating asymmetric information and debt maturity largely assumes that maturity is determined by borrowers with private information about their quality, either to signal their type to lenders or to minimize the effect of their private information on borrowing costs (e.g., Flannery (1986), Kale and Noe (1990), Diamond (1991))[1]. However, these theories largely relate to public debt in large corporations, and thus are not well suited to explain debt maturity for small businesses (see Ravid (1996) for a survey of this literature). Our sample of small private firms is more appropriate to examine the debt covenant view of debt maturity, as we believe that for such firms observed maturities are primarily driven by lenders' concerns about borrower control.

[1] In Diamond (1991) some very low rated borrowers are forced to borrow short-term because of the extreme adverse selection costs of long-term debt. In this sense, this prediction is similar to that in the debt covenant view.

Moreover, our sample consists of bank loans, and we exclude issues of notes or bonds, where firms may be more able to influence maturity.

Previous studies on debt maturity have followed two different methodological approaches. The *balance sheet approach* examines the maturity structure of total debt outstanding at a point in time. The *incremental approach* focuses on the maturity of new debt issues. We take the latter approach, which is better suited to test the hypothesis that lenders shorten maturities to more informationally opaque and risky borrowers, because lenders have direct control over the maturity of new loans, but not over the maturity structure of a firm's total liabilities. There are also practical reasons in favor of the incremental approach. We can use precise measures of maturity, rather than relying on imperfect measures such as the fraction of total debt that is long-term. It also allows us to examine what determines maturity as a function of firm characteristics at the time the loan was negotiated. Finally, we can use detailed information about the other contract terms (such as collateral pledges, guarantees, interest rate, loan amounts, fixed rates, etc.) to control for other factors that affect observed maturities.

Our results show that firms that pledge collateral obtain longer maturity lines of credit. This is consistent with collateral mitigating borrower risk-shifting incentives and lenders' concern about the higher probability of default associated with longer maturities. However, we find no statistically significant effect of guarantees. One explanation for this finding is that a guarantee is a weaker claim than a pledge of collateral, since it does not involve specific liens that prevent these assets from being sold or consumed. For other loans, which tend to be fully collateralized, we find no evidence that guarantees are associated with longer maturity loans. We also find that larger firms obtain longer

maturity loans across all loan types, and that firm age is positively associated with maturity for lines of credit. To the extent that firm size and age are inverse proxies for informational opacity, this evidence is consistent with financial intermediaries shortening loan maturity to more informationally opaque borrowers. Firm owners that have been delinquent on personal obligations are granted lines of credit with shorter maturities, providing evidence that banks force more frequent renegotiation when lending to more risky borrowers. For loans other than lines of credit, we find that more profitable firms obtain longer maturity loans. In addition, the length of the commitment is negatively related to the principal owner's age for all loan types, while it is also positively related to owner experience in the sub-sample of other loans. Taken together, these results provide strong evidence of the role of maturity in addressing information and control problems.

Our analysis uses three different proxies for the strength of the relationships: its length, borrowing concentration (our proxy is the number of institutions from which the firm borrows), and the scope, that is, the use of other informationally intensive financial services from the lender (e.g., checking and savings accounts). Contrary to our expectations we find that stronger or broader borrower-lender relationships are not associated with longer maturity loans. In particular, we find no effect of longer relationships or more concentrated borrowings on loan maturity for any loan type. Furthermore, checking accounts with the lender are associated with shorter maturities in the sample of other loans, while other financial services with the lender (such as transaction, cash management, credit related, brokerage, or trust services) are weakly related to shorter maturities for lines of credit.

Our paper contributes to the growing literature on small business finance by exploring the determinants of loan maturity. We are aware of only two studies that examine debt maturity for small businesses. Scherr and Hulburt (2001) use the NSSBF to examine debt maturity structure using the balance sheet approach. Their debt maturity structure measures include the fraction of total debt outstanding that matures in one year or more, and the weighted average maturity of all of the firms' debt. However, while their results are consistent with Diamond's (1991) model, they don't find statistically significant effects of their proxies for informational asymmetry on debt maturity structure. Our paper differs from theirs in that we focus on the maturity of new loans, as opposed to the composition of total debt, which reflects a firm's past financing decisions. Contrary to their results, our more detailed tests suggest a strong connection between information asymmetry and debt maturity. Berger, Espinosa-Vega, Frame, and Miller (2003) also use data on loans to small businesses to examine loan maturities. However they focus more on how firms determine the maturity of the loan, and therefore test the predictions in Flannery (1986) and Diamond (1991). Their results are consistent with both theoretical models for low-risk borrowers, but conflict with the predictions in Diamond's model for high-risk borrowers.

Recent work examines how large, publicly traded firms choose debt maturity (e.g., Barclay and Smith (1995), Stohs and Mauer (1996), Mitchell (1991), Guedes and Opler (1996), Dennis, Nandy and Sharpe (2000)). We add to this literature by exploring what determines the debt maturity in small, private firms, where information problems are more likely to be severe. We differ from studies on large firms in that our results are

more easily interpreted within the debt covenant view of maturity, as lenders in our sample have strong bargaining power to influence debt maturity.

Our paper also contributes to the relationship lending literature by studying the effect of relationships on the maturity of the loan contract. Previous empirical evidence points to a significant effect of stronger firm-creditor relationships on credit availability and collateral requirements (Petersen and Rajan (1994, 1995), Cole (1998), Berger and Udell (1995), Degryse and Van Cayseele (2000), Angelini, Di Salvo, and Ferri (1998)). However the effect of relationship variables on borrowing costs is mixed, and therefore not conclusive. While Berger and Udell (1995) focus on bank lines of credit and find that borrowers with longer relationships pay lower interest rates, Petersen and Rajan (1994), and Angelini, Di Salvo, and Ferri (1998), find that no significant effect on the price of credit. Degryse and Cayseele (2000) find that the loan rate increases with the duration of the relationship but decreases in the scope of the relationship. Our results suggest that the strength of the relationship has no effect in the determination of the maturity of the loan. The paper proceeds as follows. Section 2 describes the data set and the variables used in the analysis, section 3 presents the empirical tests and results, and section 4 concludes.

2. The data and variable selection

Our data source is the 1993 National Survey of Small Business Finances (NSSBF), which was conducted during 1994-95. This survey is representative of 4.9 million small businesses in the U.S. with fewer than 500 employees that were in operation as of year-end 1992. The survey contains detailed data about the contract features of the most recent loan obtained by the firm, an inventory of firm's use of

financial services, recent credit history of the firm and its owners, specific information about the owners, firm's income statement and balance sheet data[2]. The survey's focus on small firms is ideal for our purposes. Given that many of the firms in our sample do not have formal financial statements, information problems are likely to be severe. This allows us to examine the maturity of loan contracts in a context in which this contract feature could serve as an instrument to address information problems.

The original 1993 SSBF contains data on 1,695 loans. We drop 3 observations with zero sales, 7 where the reported interest rate on the loan is zero, and 13 with missing data for relevant variables[3]. Thus, our sample consists of 1,672 loans to small businesses granted during 1990-94. Table 1 shows the composition of our sample, broken down by industry, organizational form, type of lender, year of application, and the stated use of the funds.

Insert Table 1 here

The firms in our sample represent a variety of industries. While firms have different organizational forms, a majority of them are corporations (72%). Most loans were granted by banking institutions, defined to comprise credit unions, savings banks, savings and loans associations, and commercial banks. In addition, a vast majority of the loans in the sample were granted during 1993-1994, while roughly half of the loans were requested for working capital.

[2] For more details about the 1993 NSSBF see Cole and Wolken (1995).

[3] These are 11 observations where the length of the relationship with the lender was missing, and two for which information about the concentration of deposits in the lender's area was missing.

Table 2 presents summary statistics of the loan contract features for the different loan types. The median loan maturity in our sample is 12 months, ranging from one month to 30 years. The median amount borrowed is $100 thousands, while 72% of the loans are collateralized and 56% have a guarantor. The median interest rate charged is 8%, and 41% of the loans have fixed rates.

Insert Table 2 here

Almost 60% of the loans are lines of credit[4]. The contract terms differ markedly according to the loan type. Lines of credit have shorter maturities than other loan types. The amount borrowed using lines of credit is close to four times the amounts borrowed in other types of loans, except for mortgages that have similar amounts. Around 62% of the lines of credit are secured, while other loans tend to be fully collateralized, except for the other miscellaneous loans. Fixed-rate loans are less common for lines of credit than for other loan types. Median interest rates charged are not significantly different across loan types, although they tend to be lower for lines of credit[5].

Table 3 describes the variables used in the regression analysis of loan maturity, broken down into loan contract terms, informational opacity variables, financial condition variables, firm and owner credit history variables, ownership/governance variables, relationship variables, and other control variables. Among the contract characteristics,

[4] A line of credit allows a business customer to borrow up to a prespecified limit, repay all or a portion of the borrowing and reborrow as necessary until the credit line matures.

[5] This could be due to the existence of other price terms for lines of credit, specifically fees against the total amount committed, against the unused portion, or both.

Maturity is the length of the contract term in months; *Collateral* is a dummy variable indicating whether the loan was secured; *Guarantor* is a dummy variable indicating whether the loan was guaranteed; *Interest* is the interest rate paid on the loan; *Relamount* is the amount of the loan divided by total assets; *Fixedrate* is a dummy equal to one if the interest rate on the loan is fixed, and zero if it is floating.

Other contract terms interact with maturity choices. Of particular interest in exploring the use of loan maturity in addressing information problems and controlling risky borrowers is the role of collateral pledges and guarantees, as both of these features make a loan safer for the lender. It is important to note that guarantees provide less protection to the lender than guarantees. While collateral pledges involve specific assets (collateral is generally provided in the form of equipment, real estate, personal assets of the owner, inventory or accounts receivable), guarantees give the lender recourse against the firm's owners for any deficiency in payment, but do not involve any specific liens. Thus, while we expect a positive association between *Collateral* and *Guarantor* and loan maturity, we conjecture that the effect of the former should be stronger. Finally, we do not have a prediction for the effect of *Relamount*. On the one hand, an increase in leverage makes the loan riskier to the lender, and so should lead to shorter maturities. On the other hand, larger loans typically finance longer horizon activities, and so should be associated with longer maturities.

Insert table 3 here

We use two inverse proxies for informational opacity: *Firmsize*, which is firm size measured by the value of its assets, and *Firmage*, the age of the firm measured in years. As Berger, Klapper and Udell (2001) suggest, borrower size is an inverse measure of informational opacity because smaller firms typically have less informative financial statements, less experience, and lower public profiles. Also, as more public information is available to investors for older firms, firm age reflects information that becomes available to the market as a whole (a firm's public reputation). Thus, firm age also serves as an inverse proxy for informational opacity. To the extent that these variables are good proxies for firm informational opacity, we expect a *Firmsize* and *Firmage* to be positively associated with loan maturity.

Our firm financial condition variables are *Dta*, the debt-to-assets ratio, *Roa*, the return on assets, and *NWC*, current assets minus current liabilities divided by total assets. To capture the credit history of the firm and the primary owner, we code dummy variables for whether the firm's primary owner was delinquent on personal obligations in the last 3 years (*Owdelinq*), the firm was delinquent on business obligations in the last 3 years (*Firmdelinq*), the firm declared bankruptcy during the 7 years preceding the loan application (*Bankrupt*), or there are any judgments rendered against the firm's principal owner (*Judgment*). Thus, if lenders use shorter loan maturities to exert control of more risky borrowers, we expect stronger financial conditions and better credit histories to be associated with longer maturities.

Different ownership structures may be related to the amount of private information borrowers have, the risks borrowers take, and their ability to shift risk to the lenders. All of these factors are important in the determination of contract characteristics,

and could therefore have a direct effect on loan maturity. To control for governance characteristics, we include the variable *Ownmg*, which indicates whether the principal owner manages the firm, *Ownshr*, the fractional ownership of the principal owner, and *Family*, which indicates whether a single family owns at least 50% of firm. These variables could be important if owner-managers have different incentives than employee-managers regarding risk choices, or if higher ownership or family control induces better monitoring. We also include the age of the principal owner, *Ownage*, and his or her experience, *Exper*, both in years. Both of these factors are related to firm governance, and can affect loan maturity. In addition, our regressions control for the legal form of the firm by including four dummy variables indicating whether the firm is a sole proprietorship, a partnership, a subchapter S corporation, or a non-Subchapter S corporation. Sole proprietorships are the omitted category in all our regressions.

We follow the relationship lending literature in capturing the strength of firm-creditor relationships using the length of the relationship and borrowing concentration. *Length* is the length of the relationship with the lender in years, and *Multiple* is a dummy variable indicating whether the borrower has loans from more than one institution. In addition, to capture the scope of the relationships, we include dummy variables indicating whether the borrower uses informationally intensive financial services at the lending institution. *Checking*, *Savings*, and *Othfinserv* indicate whether the firm uses a checking account, a savings account, or other financial services from the lending institution (such as transaction services, cash management services, credit-related services, brokerage services, or trust services). If lenders obtain valuable information about the borrower during their ongoing relationships, they will use this information to better assess the

borrower's risk and adjust the terms of the loan contract. We therefore expect a positive association between *Length* and maturity. Under the assumption that more concentrated borrowing generates more/better information for the lender, firms with more concentrated borrowing should be able to borrow longer term. Thus, we expect a negative effect of *Multiple* on maturity. Alternatively, *Multiple* might really be a proxy of the firm's quality. Lower quality firms could be credit constrained at their primary lender, and therefore must seek additional financing in other institutions. Thus, *Multiple* might simply be a proxy for the firm's riskiness or credit quality. The use of financial services at the lending institution might also provide the lender with valuable information about the borrower's quality. We therefore expect a positive relation between maturity and *Checking*, *Savings* and *Othfinserv*.

We also control for other factors that can affect loan maturity. As there is some time variation in our sample, we include the variable *Termstruct* defined as the difference between the yield of a 10-year government bond and the yield of a 3-month Treasury bill at the time the loan was made. We include this variable because the term structure of interest rates could affect loan maturity for tax reasons (Brick and Ravid (1985)). We also use a dummy variable that indicates whether the lender operates in a market where the Herfindhal-Hirschman index of bank deposits concentration is above 1800 (*Highconc*). This variable attempts to control for any possible effects of credit market competition on loan maturity. We also code three dummy variables to control for differences in lending practices across different types of lenders. *Bank* indicates whether the lender is a bank, defined to comprise Credit Unions, Savings Banks, Savings and Loan Associations, and Commercial Banks; *Nonbank* identifies non-bank financial institutions, which include

Finance Companies, Insurance Companies, Brokerage or Mutual Fund Companies, Leasing Companies and Mortgage Banks; all other lender types (*Otherlend*) are the left-out group in our regressions[6]. As additional proxies for firm risk, we include *Tangibility*, defined as the sum of inventory and property, plant and equipment, as a fraction of total assets, and *R&D*, an indicator variable for whether the firm has employees devoted to R&D activities. We control for the owner's education using *College*, an indicator variable for whether the firm's principal owner has completed a college education. In addition, Blanchflower, Levine and Zimmerman (1998) and Cavalluzo, Cavalluzo, and Wolken (2002) suggest that minorities are discriminated in credit markets. To control for the effect of ethnical origin on loan maturity, we use *Hispanic* and *Black*, which are indicator variables for whether at least half of the firm is owned by Hispanics or African Americans. Finally, we need to control for the maturity of the existing debt, as the maturity structure of a firm's total debt outstanding may affect the maturity of new loans. For this purpose we use two proxies: *Avgmat* and *Stdebt*. *Avgmat* is the weighted-average maturity of the borrower's institutional debt calculated as the fraction of each type of debt (from the firm's balance sheet) times its maturity in months. Because the SSBF does not contain data on the maturity of outstanding debt, we follow Scherr and Hulburt (2001) in assuming maturities of 6 months for lines of credit, 30 months for capital leases, 60 months for mortgages, and 18 months for motor vehicle loans, equipment loans, and

[6] *Otherlend* includes other non-financial institutions, such as Venture Capital Firms or Small Business Investment Companies, other business firm, Family or Other Individuals, Small Business Administration, other government agencies, American Express, and Supplier Firms.

other miscellaneous loans. Our second variable, *Stdebt* is the percentage of a firm's total debt that matures in less than a year, and includes accounts payable and current liabilities.

In order to mitigate the impact of outliers in *Relamount*, *Firmsize*, *Dta*, and *Roa*, we winsorize these variables at the top/bottom 1% of the distribution. As in Berger and Udell (1995), an upper limit of 30 years was imposed on *Firmage* and *Length*, which assumes that no additional relevant information is revealed after 30 years. Summary statistics of the variables employed in the analysis are reported in Table 4.

Insert Table 4 here

The firms in the sample have median assets of $639.4 thousands, their median leverage is 0.58 and their median profit margin is 4.23%. Interestingly, 30% of the firms in the sample had been delinquent on either personal or business obligations. The median firm age is 12 years, while the median length of the relationship of firms with lenders of their last loan is 5 years. Only 29% of the firms borrow from more than one institution. On average the yield curve has been upward sloping during our sample period.

3. The determinants of loan maturity

3.1 Empirical approach

Our basic empirical model is described in equation (1) below, and uses the natural logarithm of *Maturity* as the dependent variable,

$$\text{Ln}(Maturity) = \beta_0 + \beta_1 Y + \beta_2 X + \beta_3 Loantype + \beta_4 Loanuse + \beta_5 Industry + \beta_6 Year + \varepsilon$$

(1)

where *Y* is a vector of other contract terms, *X* is a vector of predetermined variables, *Loantype* is a vector of six loan type dummies, *Loanuse* is a vector of seven different loan use dummies, *Industry* is a vector of eight industry dummies, and *Year* is a vector of four year dummies (recall that loan applications where made during 1990-1994).

One problem that arises in exploring the determinants of any loan contract term is that all loan contract features could be simultaneously determined. Thus, one problem in estimating equation (1) is that the vector of other contract terms, *Y*, is potentially endogenous. If the decision on maturity is simultaneous to the decision on another contract feature, then not only the coefficients of the contract variables could be biased, but also the coefficients of all other explanatory variables[7].

Rather than estimating an ad-hoc system with unclear exclusion restrictions or attempting to instrument the various elements contained in the vector *Y*, we address the problem as follows. First, we estimate reduced-form regressions of loan maturity on all the predetermined variables of the model, but excluding other contract terms, *Y*. The regression coefficients of *X* then reflect the effect of these variables on loan maturity, inclusive of any predicted maturity effect of the variables in *Y* that they may imply. While this econometric approach yields consistent estimates and goes a long way in exploring the effect of our key variables on loan maturity, it does not allow us to explore the effect of other contract terms on maturity, notably those that are expected to influence maturity by providing more control to lenders, such as collateral pledges and guarantees.

Second, we estimate equation (1) under the assumption that contract terms are determined sequentially, with decisions about the contract terms in *Y* preceding loan

[7] This property can be shown easily using the results on partitioned regression in Greene (1997).

maturity determination. In such specification, the estimated coefficients on the vector *X* now reflect the effect of the predetermined variables on loan maturity excluding their effect through other contract terms. Previous work assumes a similar recursive model structure to analyze the determinants of borrowing costs, with the collateral decision assumed to precede the interest rate decision (Berger and Udell (1995), Harhoff and Körting (1998), Elsas and Krahnen (1998), Degryse and Ongena (2004))[8]. A perhaps strong case can be made that collateral and guarantees can be treated as exogenous in the loan maturity regressions. Indeed, collateral is often pledged at the beginning of a relationship, and is adjusted infrequently. However, given the lack of detailed data on this complex bargaining process, we make no conclusive statement about the exogeneity of other components of *Y*, but rather explore whether substantial bias is likely to be present.

3.2 Results

Previous research shows that the effect of firm-creditor relationships on loan arrangements is typically stronger for lines of credit (LCs), because they represent a commitment by the lender to provide future financing under prespecified conditions (e.g., Berger and Udell (1995) and Harhoff and Körting (1998)). Berger and Udell (1995, p. 353) argue that LCs represent a formalization of the firm-creditor relationships and that LCs are more "relationship-driven" than other loans that are "transaction-driven". Thus, our analysis distinguishes between lines of credit and other types of loans.

[8] Berger and Udell (1995) also control for guarantees in their regressions of borrowing costs, and conclude that this introduces no significant bias. Degryse and Ongena (2004) treat loan size as exogenous in a similar regression using Belgian data, and argue that simultaneity does not bias their results.

Table 5 reports ordinary least squares (OLS) results of equation (1) for all loans, lines of credit, and other loans. Heteroskedasticity-robust t-statistics are in parenthesis below the estimates. All regressions include a constant term, year, industry and loan use dummy variables (not reported). In addition, regressions for all loans and other loans include loan type dummies (not reported). We first discuss our reduced-form results for the sample of all loans (column 1), lines of credit (column 3) and other loans (column 5). Our first interesting result concerns the effect of our inverse proxies for informational opacity. We find a positive and statistically significant effect of *Firmsize* on loan maturity across all loan types. We also find a positive effect of *Firmage* on loan maturity for lines of credit, but no effect for other loan types[9]. Taken together, these results are consistent with financial intermediaries lending with shorter maturities to more informationally opaque borrowers.

Insert Table 5 here

We find no effect of our financial condition variables for the whole sample and for lines of credit. However, the coefficient on *Roa* is positive and statistically significant for other loans, suggesting that better financial conditions are associated with longer maturities for these other loans. Of the credit history variables, the coefficient on *Owdelinq* is negative for all loan types, and statistically significant for lines of credits, but

[9] The coefficient on $Firmage^2$ is negative and statistically significant, suggesting a concave relation between firm age and loan maturity. However, the effect of firm age on loan maturity remains positive for all of the values in our sample.

not for other loans. This result suggests that lenders use shorter maturities to exert control over borrowers with poor personal credit histories. None of the other credit history variables are significant. One explanation is that when lending to small businesses, banks rely more on the use of hard information on the business owner's record in paying off personal debt, rather than on the less reliable information on the business itself[10]. Regarding our ownership/governance variables, we find a statistically significant and negative effect of *Ownage* on loan maturity across all loan types, and positive and significant coefficients of *Ownshr* and *Exper* for the sample of other loans. We interpret these results as evidence that older, less experienced, and lower ownership primary owners are less able (or lack the incentive) to run a firm efficiently, or are less able to monitor and control the firm's manager, thus reducing the likelihood of generating sufficient funds to repay the loan[11].

Contrary to our expectations, we find no evidence of a positive association between stronger firm-creditor relationships and longer maturities. None of our measures of the strength of the relationship with the lender (*Length* and *Multiple*) have a statistically significant effect on loan maturity, even if we restrict the analysis to lines of credit, which as discussed above, are likely to be more driven by relationships. In

[10] Lenders such as Wells Fargo are increasingly applying to small businesses the statistics-based methods long used to review consumer applications for credit cards and mortgages. They pinpoint a few pieces of hard information, mainly related to the owner's personal record.

[11] An alternative interpretation of the coefficient on *Ownage* is that older owners are expected to retire sooner (or even die), forcing the lender to renegotiate with an unknown successor, thus making the loan riskier.

addition, the use of informationally intensive financial services at the lending institution is not associated with longer maturities. Moreover, the use of checking accounts is negatively related with the maturity of the loan obtained for other types of loans.

All of the results from the reduced-form regressions remain statistically significant and of the same sign and magnitude when the potentially endogenous contract terms are added to the regressions (columns 2, 4, and 6). This suggests that including the vector *Y* in the right-hand side of equation (1) introduces no substantial bias on the coefficient estimates of the variables in *X*. The most important results that arise from including the vector *Y* are related to collateral pledges and guarantees. For lines of credit, we find a strong and statistically significant association between collateral pledges and maturity, but no effect of guarantees. This is consistent with collateral mitigating borrower risk-shifting incentives and lenders' concern about the higher probability of default associated with longer maturities. One explanation for the lack of significance of guarantees is that a guarantee is a weaker claim than a pledge of collateral, since guarantees do not involve specific liens that prevent these assets from being sold or consumed. For other loans we find a positive effect of collateral, but it is not statistically significant. This is due to the fact that most loans in that sub-sample are fully collateralized, and so the loan type dummies already capture the effect of collateral on maturity (if we drop these dummies *Collateral* becomes statistically significant). In addition, we find a positive effect of *Relamount* for all loan types and a negative effect of *Fixedrate* in the sample of other loans, but not for lines of credit. Given our previous discussion about endogeneity issues, we do not make any claim regarding causality here.

To summarize, our evidence supports the hypothesis that financial intermediaries use loan maturity to address information problems when lending to small and young firms. While the results are consistent with lenders shortening maturities to more informationally opaque, risky borrowers, we do not find evidence of a positive association between the strength or scope of firm-creditor relationships and loan maturity.

3.3 Robustness checks

We conduct two robustness checks. First, most of the firm financial characteristics correspond to 1992, while some of the loans where granted in 1990-1992. This means that for some firms in our sample the financial data that we use in our regressions as explanatory variables were not available at the time of the loan. Unless the firm's financial condition was fairly stable, this could introduce biases. Of the 1,672 loans in our sample, 1,463 were obtained in 1993-1994. We repeated our regression analysis focusing only on loans made after 1993 and our results remain qualitatively unchanged.

To explore whether our results on collateral pledges and guarantees could be due to biases introduced by other endogenous contract terms, we repeated our analysis after dropping all elements of *Y*, except for *Collateral* and *Guarantor*, which are more likely to be exogenous in our regressions than the other contract terms. Results are similar to those reported, and are available from the authors.

4. Conclusions

We use the 1993 National Survey of Small Businesses Finances to study the determinants of loan maturity. We hypothesize that financial intermediaries use loan maturities to exert control over small, informationally opaque businesses, and base our tests on the assumption that longer maturities exacerbate the consequences of borrower-lender informational asymmetries. Our hypothesis implies that lenders will shorten maturities to more informationally opaque and risky borrowers. Thus, we predict a positive association between loan maturity and informational transparency, better financial condition, and better credit history. We also explore the role of firm-creditor relationships in explaining loan maturity. If relationships generate valuable information for the lender and attenuate the problems arising from the informational opacity of small firms, then we expect that stronger and broader relationships should be associated with longer term lending. In addition, to the extent that collateral pledges and guarantees provide protection to the lender against borrower misbehavior, secured and guaranteed loans should have longer maturities.

We find that both of our measures of borrower informational transparency, firm size and firm age, are associated with longer maturity loans. However, while the effect of firm size is statistically significant across all loan types, the effect of firm age is only significant for lines of credit. As expected, collateral pledges are associated with longer maturities for lines of credit, but we find no effect of guarantees. One explanation for this finding is that collateral, as opposed to personal guarantees, involve liens to specific assets, and thus give the lender better protection. We find that poor credit history by the firm owner is associated with shorter maturities for lines of credit, while better financial condition (measured by firm profitability) is related to longer maturities for other loan

types. In addition, we find that more experienced and younger firm owners are related to longer maturities. Contrary to our expectations, longer firm-creditor relationships, more concentrated borrowing, and the existence of checking, savings or other types of accounts with the lender (scope of the relationship) are not associated with longer maturities. While the evidence in the literature points to a strong effect of borrower-lender relationship on the access to credit, our results, together with the evidence summarized in the introduction, leads to conclude that the effect of relationship variables on contract characteristics is mixed, and therefore not conclusive.

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Table 1
Sample Composition

The sample consists of 1,672 loans to small businesses obtained from the National Survey of Small Businesses Finances 1993.

	# Obs.	% of sample
By Industry		
Mining	17	1.0
Construction	196	11.7
Manufacturing	283	16.9
Transp., Comm. & Public Utilities	77	4.6
Wholesale Trade	177	10.6
Retail Trade	337	20.2
Insurance & Real Estate	98	5.9
Services	487	29.1
By Organizational Form		
Sole Proprietorship	295	17.6
Partnership	124	7.4
S-Corporation	477	28.5
C-Corporation	776	46.4
By Type of Lender		
Bank[1]	1,469	87.9
Non-Bank[2]	160	9.6
Other[3]	43	2.6
By Year Applied		
1990	4	0.2
1991	48	2.9
1992	157	9.4
1993	585	35.0
1994	878	52.5
Loan Use		
Working capital	909	54.4
Motor Vehicles, Other Equipment/Machinery	373	22.3
Leasehold Improvements, Land and Buildings, Furniture and Fixtures	218	13.0
Inventory accumulation	48	2.9
Debt Relief or Refinancing	65	3.9
Business Expansion, Acquisitions	44	2.6
Other Uses [4]	15	0.9

[1] Includes credit unions, savings banks, savings & loans associations, and commercial banks.
[2] Includes finance companies, insurance companies, brokerage or mutual funds companies, leasing companies, and mortgage banks.
[3] Includes other non-financial institutions, such as VC firms of small business investment companies, other business firm, family or other individuals, SBA, other government agencies, American Express, and supplier firms.
[4] Includes taxes owed and multiple uses.

Table 2

		Maturity (months)					Collateral	Guarantor	Median Interest Rate	Median Amount	Fixed Rate
Type of Loan	# obs	Mean	Median	Min	Max	Stdev.	(%)	(%)	(%)	($ 000s)	(%)
Lines of Credit	997	23.2	12	1	240	29.0	62.1	59.4	8.0	200.0	28.3
Capital Leases	40	54.3	60	12	240	41.3	100.0	57.5	8.9	42.5	80.0
Mortgages	145	128.0	120	1	360	98.5	99.3	56.6	8.5	206.0	42.8
Motor Vehicle	128	39.8	36	1	180	29.4	99.2	39.8	8.4	20.0	82.8
Equipment	153	44.7	36	1	240	31.3	99.3	50.3	8.5	47.0	64.1
Other Misc.	209	48.0	36	1	360	87.8	57.9	52.6	8.5	54.8	53.6
All Loans	1,672	39.4	12.0	1	360	52.9	71.9	55.9	8.0	100.0	41.4

Table 3
Variable Definition

Loan Contract Terms

Maturity	Length of the loan contract (months)
Collateral	= 1 if the loan was secured, zero otherwise
Guarantor	= 1 if the loan was guaranteed, zero otherwise
Interest	Interest paid (%)
Relamount	Approved amount / Total assets
Fixedrate	= 1 if the interest rate on the loan was fixed, zero otherwise

Informational Opacity

Firmsize	Total assets ($000s)
Firmage	Firm age (years) [1]

Financial Condition

Dta	Total debt / total assets
Roa	Return on assets
NWC	(Current assets-current liabilities)/total assets

Firm and Owner Credit History

Owdelinq	# of personal obligations the owner was delinquent 60 days or more during the last 3 years [2]
Firmdelinq	# of business obligations the firm was delinquent 60 days or more during the last 3 years [2]
Bankrupt	= 1 if the firm declared bankruptcy during the last 7 years, zero otherwise
Judgment	= 1 if there are any judgments rendered against the firm owner, zero otherwise

Ownership/Governance

Ownmg	= 1 if the firm is managed by an owner, zero otherwise
Ownshr	Ownership share of the firm's principal owner (%)
Family	= 1 if a single family owns at least 50% of the firm, zero otherwise
Ownage	Age of the principal owner (years)
Exper	Owner experience (years)
Sole	=1 if the firm is constituted as a sole proprietorship, zero otherwise (omitted in regressions)
Partner	=1 if the firm is constituted as a partnership, zero otherwise
S-Corp	=1 if the firm is constituted as a subchapter S corporation, zero otherwise
Corp	=1 if the firm is constituted as a C corporation, zero otherwise

Relationship Variables

Length	Length of the relationship with lender (years)[1]
Multiple	= 1 if the firm borrows from more than one institution, zero otherwise
Checking	= 1 if the firm has checking accounts with the lender, zero otherwise
Savings	= 1 if the firm has savings accounts with the lender, zero otherwise
Othfinserv	= 1 if the firm has other financial services with the lender, zero otherwise [3]

Table 3 (Cont.)
Variable Definition

Other Control Variables	
Termstruct	Yield of a 10-year govt. bond minus yield of a 3-month T-Bill when loan was made
Highconc	= 1 if the concentration of deposits in the lender's area is high, zero otherwise
Bank	=1 if the lender is a banking institution, zero otherwise [4]
Nonbank	=1 if the lender is a non-bank financial institution, zero otherwise [5]
Otherlend	=1 if the lender is a non financial institution, zero otherwise (omitted in regressions) [6]
Tangibility	Sum of inventory, land, and depreciable assets / total assets
R&D	= 1 if the firm has employees devoted to R&D, zero otherwise
College	=1 if the principal owner has at least completed a college education, zero otherwise
Hispan	= 1 if more that 50% of the firm is owned by Hispanics, zero otherwise
Black	= 1 if more that 50% of the firm is owned by African Americans, zero otherwise
Avgmat	Weighted-average maturity of the borrower's institutional debt
Stdebt	Accounts payable and current liabilities as fraction of total debt

[1] An upper limit of 30 years was imposed on Firmage and Length, which assumes that no additional relevant information is revealed after 30 years.
[2] The variable takes four values, 0, 1, 2, and 3 corresponding to zero, one, two and three or more delinquencies.
[3] Includes transaction, cash management, credit related, brokerage, or trust services.
[4] Includes credit unions, savings banks, savings & loans associations, and commercial banks.
[5] Includes finance companies, insurance companies, brokerage or mutual funds companies, leasing companies, and mortgage banks.
[6] Includes other non-financial institutions, such as VC firms of small business investment companies, other business firm, family or other individuals, SBA, other government agencies, American Express, and supplier firms.

Table 4
Summary Statistics

	Mean	Median	Stdev.
Loan Contract Terms			
Maturity	39.38	12.00	52.93
Collateral	0.72		
Guarantor	0.56		
Interest	8.48	8.00	2.15
Relamount	0.52	0.25	0.92
Fixedrate	0.41		
Informational Opacity			
Firmsize	2,983.27	639.37	5,980.25
Firmage	14.42	12.00	8.76
Financial Condition			
Dta	0.66	0.58	0.49
Roa	0.39	0.10	1.30
NWC	-0.04	0.00	0.13
Firm and Owner Credit History			
Owdelinq	0.09		
Firmdelinq	0.21		
Bankrupt	0.02		
Judgment	0.04		
Ownership/Governance			
Ownmg	0.77		
Ownshr	67.59	61.50	30.19
Family	0.76		
Ownage	50.10	49.00	10.50
Exper	20.56	20.00	10.67
Relationship Variables			
Length	7.84	5.00	8.41
Multiple	0.29		
Checking	0.72		
Savings	0.27		
Othfinserv	0.45		
Other Control Variables			
Termstruct	2.84	2.84	0.36
Highconc	0.52		
Tangibility	0.59	0.62	0.27
R&D	0.31		
College	0.60		
Hispan	0.05		
Black	0.05		
Avgmat	15.9	11.7	15.66
Stdebt	0.40	0.33	0.33

Table 5
Multivariate Analysis of Loan Maturity

The dependent variable is Ln(maturity). All regressions include a constant term, year, industry, loan type, and loan use dummy variables (not reported). Heteroskedasticity robust t-statistics are in parenthesis below the estimates. *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively.

	All Loans			Lines of Credit			Other Loans		
	(1)		(2)		(3)		(4)		(5)		(6)	
Loan Contract Terms												
Collateral			0.184	***			0.173	***			0.256	
			(3.54)				(3.39)				(1.57)	
Guarantor			0.034				-0.078				0.130	
			(0.75)				(1.52)				(1.55)	
Interest			-0.013				-0.014				-0.006	
			(1.14)				(0.92)				(0.35)	
Relamount			0.107	***			0.072	**			0.155	***
			(4.41)				(2.35)				(3.79)	
Fixedrate			-0.161	***			-0.040				-0.315	***
			(3.02)				(0.64)				(3.40)	
Informational Opacity												
Ln(Firmsize)	0.052	***	0.049	***	0.041	**	0.032	*	0.069	**	0.073	**
	(3.36)		(2.93)		(2.39)		(1.75)		(2.35)		(2.40)	
Firmage	0.017		0.016		0.039	***	0.042	***	-0.008		-0.010	
	(1.34)		(1.31)		(2.69)		(2.85)		(0.33)		(0.46)	
Firmage ^{2}	-0.000		-0.000		-0.001	**	-0.001	***	0.000		0.000	
	(1.17)		(1.14)		(2.55)		(2.71)		(0.52)		(0.57)	
Financial Condition												
Dta	0.035		-0.031		-0.008		-0.048		0.092		-0.004	
	(0.68)		(0.59)		(0.12)		(0.71)		(1.08)		(0.05)	
Roa	0.014		0.004		-0.011		-0.020		0.064	**	0.055	*
	(0.82)		(0.25)		(0.49)		(0.90)		(2.16)		(1.86)	
NWC	-0.208		-0.228		-0.101		-0.142		-0.359		-0.346	
	(1.13)		(1.24)		(0.50)		(0.72)		(0.98)		(0.93)	
Firm and Owner Credit History												
Owdelinq	-0.100	***	-0.094	**	-0.105	**	-0.104	**	-0.097		-0.097	
	(2.61)		(2.53)		(2.53)		(2.51)		(1.58)		(1.65)	
Firmdelinq	0.021		0.019		0.040		0.035		-0.002		-0.004	
	(0.94)		(0.86)		(1.59)		(1.44)		(0.05)		(0.11)	
Bankrupt	0.102		0.067		0.198		0.206		0.090		0.052	
	(0.57)		(0.39)		(0.77)		(0.80)		(0.42)		(0.29)	
Judgment	0.021		0.006		0.050		0.049		0.016		-0.036	
	(0.16)		(0.05)		(0.37)		(0.36)		(0.07)		(0.16)	

Table 5 (Cont.)
Multivariate Analysis of Loan Maturity

	All Loans				Lines of Credit				Other Loans			
	(1)		(2)		(3)		(4)		(5)		(6)	
Ownership/Governance												
Ownmg	0.025		0.019		0.070		0.079		-0.032		-0.045	
	(0.51)		(0.39)		(1.36)		(1.52)		(0.31)		(0.46)	
Ownshr	0.001		0.001		-0.001		-0.001		0.003	*	0.004	**
	(0.66)		(0.93)		(1.45)		(1.18)		(1.90)		(2.23)	
Family	-0.001		0.007		0.002		0.011		0.024		0.005	
	(0.01)		(0.13)		(0.03)		(0.18)		(0.22)		(0.04)	
Ownage	-0.051	***	-0.054	***	-0.050	**	-0.052	**	-0.080	**	-0.089	***
	(2.67)		(2.86)		(2.34)		(2.41)		(2.34)		(2.71)	
Ownage ^{2}	0.000	**	0.001	***	0.000	*	0.000	*	0.001	**	0.001	***
	(2.48)		(2.69)		(1.88)		(1.95)		(2.46)		(2.86)	
Exper	0.018	*	0.017	*	0.012		0.012		0.030	**	0.030	**
	(1.92)		(1.89)		(1.11)		(1.05)		(2.01)		(2.09)	
Exper ^{2}	-0.000	*	-0.000	*	-0.000		-0.000		-0.001	**	-0.001	**
	(1.65)		(1.67)		(0.35)		(0.30)		(2.39)		(2.48)	
Partner	-0.065		-0.050		-0.195		-0.124		0.109		0.095	
	(0.54)		(0.42)		(1.22)		(0.80)		(0.59)		(0.54)	
S-Corp	0.032		0.016		-0.105		-0.066		0.168		0.109	
	(0.39)		(0.20)		(0.99)		(0.63)		(1.35)		(0.90)	
C-Corp	-0.069		-0.091		-0.169		-0.142		0.016		-0.043	
	(0.86)		(1.14)		(1.64)		(1.38)		(0.13)		(0.35)	
Relationship Variables												
Length	-0.012		-0.008		-0.014		-0.011		-0.003		0.006	
	(1.18)		(0.77)		(1.13)		(0.95)		(0.15)		(0.33)	
Length ^{2}	0.000		0.000		0.000		0.000		-0.000		-0.000	
	(0.44)		(0.12)		(0.56)		(0.44)		(0.27)		(0.70)	
Multiple	0.011		0.004		-0.011		-0.015		0.019		0.018	
	(0.22)		(0.09)		(0.20)		(0.27)		(0.23)		(0.21)	
Checking	-0.126		-0.111		-0.042		-0.016		-0.285	**	-0.251	**
	(1.62)		(1.46)		(0.42)		(0.16)		(2.28)		(2.07)	
Savings	-0.004		0.014		0.006		0.027		-0.039		0.002	
	(0.09)		(0.29)		(0.12)		(0.52)		(0.36)		(0.02)	
Otherfinserv	-0.038		-0.064		-0.097	*	-0.117	**	0.136		0.098	
	(0.70)		(1.20)		(1.66)		(1.99)		(1.22)		(0.91)	

Table 5 (Cont.)
Multivariate Analysis of Loan Maturity

	All Loans		Lines of Credit		Other Loans	
	(1)	(2)	(3)	(4)	(5)	(6)
Other Control Variables						
Termstruct	0.122	0.122	0.034	0.040	0.167	0.143
	(1.49)	(1.52)	(0.36)	(0.42)	(1.14)	(1.00)
Highconc	-0.028	-0.017	-0.009	-0.006	-0.015	0.026
	(0.63)	(0.40)	(0.19)	(0.12)	(0.18)	(0.32)
Bank	0.168	0.078	0.527 *	0.430	0.038	-0.065
	(0.90)	(0.42)	(1.83)	(1.49)	(0.17)	(0.29)
Nonbank	0.291	0.233	0.679 **	0.564 *	0.117	0.134
	(1.59)	(1.28)	(2.30)	(1.90)	(0.54)	(0.61)
Tangibility	0.077	0.089	-0.041	-0.051	0.168	0.204
	(0.87)	(1.01)	(0.37)	(0.47)	(1.13)	(1.39)
R&D	-0.008	-0.007	-0.024	-0.024	0.012	0.018
	(0.17)	(0.14)	(0.44)	(0.43)	(0.12)	(0.19)
College	0.015	0.006	0.000	-0.001	0.027	0.007
	(0.31)	(0.13)	(0.01)	(0.03)	(0.30)	(0.08)
Hispanic	0.150	0.163	0.266 **	0.269 **	-0.019	0.010
	(1.38)	(1.51)	(2.50)	(2.55)	(0.10)	(0.06)
Black	0.154	0.140	0.101	0.072	0.124	0.121
	(1.36)	(1.28)	(0.72)	(0.52)	(0.62)	(0.62)
Avgmat	0.001	0.002	0.007 ***	0.008 ***	-0.004	-0.004
	(0.75)	(1.11)	(3.46)	(3.94)	(1.62)	(1.50)
Stdebt	-0.075	-0.083	0.038	0.030	-0.236	-0.283 *
	(0.88)	(0.98)	(0.41)	(0.32)	(1.54)	(1.90)
R^2	0.37	0.39	0.25	0.27	0.34	0.38
Obs.	1,672	1,672	997	997	675	675