Loan Commitments and Private Firms*

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Bank lending is an important source of funding for firms. Most loans are in the form of credit lines. Empirical studies of line demand have been complicated by their use of data on publicly traded firms, which have a wide menu of financing options. We avoid this problem by using a unique proprietary data set from a large financial institution of loan commitments made to 712 privately-held firms. We test Martin and Santomero's (1997) model, in which lines give firms the speed and flexibility to pursue investment opportunities. Our findings are consistent with their predictions. Firms facing higher rates and fees have smaller credit lines. Firms with higher growth commit to larger lines of credit and have a higher rate of line utilization. Firms experiencing more uncertainty in their funding needs commit to smaller credit lines. Almost all firms convert unused credit line portions into spot loans and take out new lines.

JEL Classifications: G21; G31; E44

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1. Introduction

Commercial bank lending is an important source of funds for firms. Banks arguably have better access to information and better monitoring skills than other sources of funding (Black, 1975; Fama, 1985; and Nakamura, 1993), and are thus able to decrease adverse selection costs of "information-problematic" borrowers (Diamond, 1984, 1991; Ramakrishnan and Thakor, 1984; Hadlock and James, 2002).

Most commercial bank lending (over 70 percent of business lending[1]) comes in the form of drawdowns of loan commitments rather than spot-market loans. A loan under commitment (or line of credit) is a forward contract issued to provide debt under specified terms allowing a firm to borrow as much of the prefixed line as needed over a specified time interval. While credit line arrangements subject client firms to higher prices, fees and penalties than do spot loans,[2] they are perceived as being flexible and convenient for the borrower (Martin and Santomero, 1997) and are generally used to provide working capital (Berger and Udell, 1998).

Though there are many theoretical models of lending under commitment[3], there are relatively fewer empirical studies.[4] Many of these look at the determinants of credit supply. Those that do examine credit demand use publicly-traded firms; the large menu of financing options available to such firms significantly complicates making inferences about the demand for any individual source of credit.

In this paper, we avoid this problem by using a unique proprietary data set from a large financial institution on the credit line usage of 712 privately-held firms. These private firms do not use public debt and equity markets, and usually obtain credit through commercial banks.

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[1] Melnik and Plaut (1986a, 1986b).

[2] In addition to an up-front commitment fee, a client firm is also charged an interest rate when it uses its credit line (this credit line usage is called a takedown), a non-usage of credit line fee is charged when a takedown is less than the borrower's prefixed credit line, and there is an overrun penalty when portion of credit used by a client firm exceeds its prefixed credit line.

3 See, e.g., Campbell (1978), Hawkins (1982), Melnik and Plaut (1986a, b), Thakor and Udell (1987), Boot, Thakor and Udell (1987), Berkovitch and Greenbaum (1991), Morgan (1994), Berger and Udell (1995), and Martin and Santomero (1997).

[4] See, e.g., Ham and Melnik (1987), Melnik and Plaut (1986b), Avery and Berger (1991), Berger and Udell (1992, 1998), Shockley and Thakor (1997), and Strahan (1999).

We test Martin and Santomero's (1997) model of the demand for credit lines, in which lines permit firms to move quickly to take advantage of investment opportunities. Our results are uniformly in line, qualitatively, with their predictions.

Increases in up-front commitment fees, the interest rate, and risk premium spread lead to large reductions in the size of lines obtained, while increases in fees for overcharging the lines raise line demand. Increases in mean profit growth, a proxy for future investment opportunities, lead to very large increases in credit lines, while increases in the volatility of profit growth or in cash flow (a source of internal funds) cause, respectively, large and moderate decreases in the size of lines.

We additionally find weak evidence against other models of loans under commitment, in which such loans help firms hedge against the possibility that their own credit ratings may decline (Campbell, 1978 and Hawkins, 1982); the quantity of credit demanded is negatively related to firm risk.

If firms do use credit lines for their flexibility, the timing of line acquisition, size and usage will be jointly determined; firms will not want to use all of their lines, as that would leave them at risk of not being able to fund new opportunities. We examine this idea in two ways. First, we find in our data that firms turn almost all of the remainder of their credit lines into spot loans and obtain new lines well before the original line runs out. Second, we see if line utilization responds to the same variables we found to influence line demand. With the exception of up-front fees, all variables affect line utilization in the same way as they do line size.

The rest of the paper proceeds as follows: Section 2 reviews the literature and discusses in detail the Martin and Santomero (1997) model; Section 3 presents the empirical specifications and discusses the definition and prediction of each variable; Section 4 describes the data; Section 5 discusses the empirical results; and Section 6 concludes.

2. Literature Review and Model

There are several competing views of the role of loan commitments in credit markets. According to one strand of the literature, loan commitments serve as a hedging tool to safeguard firms against deterioration in the borrower's own credit worthiness (see,

e.g., Campbell, 1978; Hawkins, 1982).[5] A second body of work argues that loan commitments help private firms hedge against market credit rationing or credit crunches (e.g., Blackwell and Santomero, 1982; Melnik and Plaut, 1986a; Sofianos, Wachtel and Melnik, 1990; Avery and Berger, 1991; Berger and Udell, 1992; Morgan, 1994). A third view contends that loan commitments help resolve adverse selection (e.g., Thakor and Udell, 1987; Shockley and Thakor, 1997)) and moral hazard problems (e.g., Boot, Thakor and Udell, 1987 and 1991; Berkovitch and Greenbaum, 1991; Duan and Yoon, 1993) occurring in the spot-market for loans or commercial paper (Kanatas, 1987). A fourth strand argues that the relative speed and flexibility offered by credit lines enables firms to take advantage of investment opportunities that would disappear if they had to obtain approval for spot-market loans (Martin and Santomero, 1997).

Most of the studies above that are empirical have looked at the supply of loans by banks. Several papers have looked at the determinants of the quantity of credit supplied. Berger and Udell (1992), using a large sample of over 1 million loans, test the credit rationing hypotheses. After controlling for macroeconomic and bank information, the authors find mixed evidence for credit rationing. Loan rates exhibit substantial degree of stickiness and the share of new non-commitment loans declines when credit markets tighten; but the proportions of new commitment loans do not substantially increase with real interest rates, which is inconsistent with credit rationing. Sofianos et al. (1990) examine the transmission of monetary policy to bank loan markets (committed and non-committed loans) through both interest rate and quantity rationing channels using a VAR model. The authors find that while the interest rate channel affects both types of loans, the quantity rationing channel only impact non-committed loans; the implication is that borrowers obtain loan commitments to hedge against credit rationing. Morgan (1994) tests the lending channel of monetary policy by looking at the behavior of loan commitments after monetary policy shocks. Using a sample of 101 non-financial corporations (firms from the industrial, services, and construction sectors), Melnik and Plaut (1986b) find that the size of the loan commitment is increasing in risk premium,

[5] A key implication of these options model is that risk-averse firms either use all or none of the given credit line; in fact, most credit lines are not fully used. Greenbaum and Venezia (1985) note that according to the Federal Reserve's loan commitment surveys, the mean takedowns are less than 50 percent. Martin and Santomero (1997) note that firms on average use about 65 percent of their credit line.

duration of the contract, commitment fee, if any collateral is used to secure the loan, firm size, as well as firm's liquidity position as measured by the current ratio; the authors note that these six factors explain 40 percent of the variance in the loan commitment size.

Other papers look at the determinants of the price (i.e., rates and fees) of credit supplied. Shockley and Thakor (1997) use a sample of 2,513 loan commitments and lines of credit of publicly traded firms to look at the interrelationships among fees, borrower-specific contract terms, "material adverse change" (MAC) clauses and firm characteristics.[6] After incorporating the observed structure of loan commitment contracts into their theoretical model, the authors' empirical findings support their model's predictions: (1) informationally opaque firms (smaller, less well-known firms whose assets are difficult to value and/or with lower credit quality) are more and more likely to choose commitments with usage fees, however, borrowers pledging collateral are less likely to pay usage fees; (2) the interest rate markup on the commitment loan is positively correlated with the usage fee; and (3) the inclusion of usage fees can lead to abnormal returns related to new loan commitments of 189 publicly traded firms. Strahan (1999) examines the impact of borrower characteristics on banks' use of price (as measured by a risk premium spread) and non-price terms (such as collateral pledged to secure the loan) of loan contracts (lines of credits and term loans) to reduce their risk exposures associated with adverse selection and moral hazard problems. He finds that the pricing of both types of loans decreases in borrower credit quality, firm size, profitability, and liquidity, while pricing increases with 'hard-to-value' firms. Equally important, he also finds that firms paying non-price terms, such as pledging collateral, pay a higher price; this finding is followed by a second set of empirical result indicating that smaller, riskier, less profitable, and harder-to-value firms are more likely to pledge collateral in order to secure their loans.

Ham and Melnik (1987) is one of the few papers to examine loan demand, more specifically looking at credit line usage (takedown). Using a sample of 90 non-financial

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[6] According to Shockley and Thakor (1997), the MAC clause "…gives the bank the option to escape its lending commitment under ambiguously defined conditions. More subtly, the MAC clause often gives the bank the discretion to limit the amount borrowed under the commitment. When combined with various covenants concerning capital expenditures, the MAC clause typically gives the bank wide latitude to limit borrowing under the commitment if the borrower's condition deteriorates." (pp. 521).

corporations, they find takedown is directly related to total sales, borrowed reserves, and if collateral is used to secure the loan, and is negatively related to interest rate costs (risk premium plus commitment fee).

Hence while both price and quantity characteristics of credit supply have been frequently studied, there is relative little work on the aspects of credit demand. In this paper, we look at the determinants of both the size of credit lines demanded and their utilization. To develop testable predictions about the former, we use the model of Martin and Santomero (1997), in which the primary reasons for using credit lines are their speed and flexibility relative to spot loans. We re-derive their model below.

A firm's demand for loans under commitment will be a function of its need for external funds given the stochastic arrival of investment opportunities. Let N_t denote its net need for external credit, and assume N_t follows the geometric Brownian motion $dN_t = \nu N_t dt + \sigma N_t dW$ (where N_0 given, $-\sigma^2/2<\nu<\infty$, $\sigma>0$ is the instantaneous standard deviation, $\nu>-\sigma^2/2$ is the drift, and dW is the increment of a standard Wiener process). Let z denote the per-unit return on investment projects undertaken, so that the gross return on N_t funds invested is zN_t.

By assumption, this need for external finance cannot be satisfied by spot-market loans, since the opportunities will disappear before such loans can be negotiated. Hence to take advantage of these opportunities, firms must establish a line of credit. Firms face three kinds of charges for their credit line arrangements - commitment, takedown, and overrun fees.[7] For a given beginning-of-period level of prefixed line of credit Q committed by the bank, the client firm pays an up-front commitment fee c ($c>0$). On takedowns of a credit line, the firm pays an instantaneous interest rate of $r+d$, where r is the benchmark lending rate, d is the spread paid over the benchmark for takedowns ($d\geq 0$), $r+d$ must be below the rate of the spot loan. On overruns exceeding the beginning of the period Q credit line, the firm incurs an additional cost for exceeding its credit line of s.

The firm's expected PDV of future profits (with discount rate ρ) as a function of its size of credit line (Q) chosen at the beginning of the period will then be given by:

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[7] In their model, Martin and Santomero (1997) assume that the commitment fee includes a proportion of the unused portion of the credit line amount and an up-front commitment fee.

$$\Pi(Q) = E\left\langle -cQ + \int_0^{\infty} e^{-\rho t}\left[(z-r-d)N_t - s\max\{0, N_t - Q\}\right]\ dt \right\rangle \qquad (1)$$

It is more convenient to work with the dual (i.e. cost-minimizing) version of the firm's problem. The firm thus chooses Q to minimize its cost of borrowing, which can be simplified to:

$$\min_{Q}\ C(Q) = cQ + sQ\left(\frac{N_o}{Q}\right)^{\delta}\frac{\rho+\gamma\nu}{\rho(\rho-\nu)(\gamma+\delta)}, \qquad (2)$$

$$\delta = \frac{-\nu + \frac{1}{2}\sigma^2 + \sqrt{\left(\nu - \frac{1}{2}\sigma^2\right)^2 + 2\rho\sigma^2}}{\sigma^2} \quad \text{and} \quad -\gamma = \frac{-\nu + \frac{1}{2}\sigma^2 - \sqrt{\left(\nu - \frac{1}{2}\sigma^2\right)^2 + 2\rho\sigma^2}}{\sigma^2},$$

where $\delta > 1$. Note that the first term is increasing in Q, while the second term is decreasing in Q (since $\delta > 1$).

Differentiating equation (2) with respect to Q gives the necessary first order condition that allows us to solve for the optimal line of credit Q^* as a function of a commitment fee (c), an overrun charge (s), and the drift (ν) and standard deviation (σ) of the net needs process:

$$Q^* = N_0\left(\frac{-s(1-\delta)(\rho+\gamma\nu)}{c\rho(\rho-\nu)(\gamma+\delta)}\right)^{1/\delta} \qquad (3)$$

where $(1-\delta)$ is negative since $\delta > 1$, and $(\rho-\nu)$ is assumed to be positive.

From equation (3), we can derive several comparative static results about the relationship between the quantity of credit demanded, fees (s and c) and parameters affecting the net need for external funds (ν and σ):

(1) $\frac{\partial Q^*}{\partial c} < 0$. As commitment fees rise, the borrowing firm is more likely to take its chances on the possibility of having to pay an overrun penalty by lowering Q*.

(2) $\frac{\partial Q^*}{\partial s} > 0$. As overrun fees rise, the borrowing firm is more likely to contract a higher credit line today to avoid an overrun.

(3) $\frac{\partial Q^*}{\partial \nu} > 0$. As trend growth in the net need for external financing rises, firms require more funds.

(4) $\frac{\partial Q^*}{\partial \sigma} < 0$. Increased volatility in the net needs process leads firms to reduce their credit lines; heuristically, though the probability of a realization in the upper tail of the net needs process is now higher, the expected cost of paying an overrun fee is still less than the certain cost of paying an up-front commitment fee.

3. Empirical Specification

To test propositions (1) – (4) above, we specify the demand for credit as a linear function of fees and proxies for the growth and standard deviation of the net need for funds, while also controlling for other factors not modeled above that might affect demand:

$$Q_i = \beta_0 + \beta_1' Price_i + \beta_2' NetFundNeeds_i + \beta_3 Risk_i + \beta_4' Collateral_i + \beta_5' Age_i + \beta_6' SIC_i + \beta_7' State_i + \varepsilon_i \quad (4)$$

We measure demand for credit, Q_i by the size of the line commitment relative to firm assets, in accord with Martin and Santomero's (1997) definition. We also use line utilization (takedown as a fraction of the line amount) for two reasons: first, as we argue below in greater detail, line usage may itself be jointly determined with line size; second, Ham and Melnik (1987) have argued that line utilization is a measure of line demand.

$Price_i$ is a vector of contract pricing components. It includes commitment fees (c), overcharge fees (s), the interest rate (or usage fee, r), and the risk premium spread.

$NetFundNeeds_i$ consists of measures of the mean and standard deviation of the firm's net need for funds (i.e. ν and σ). Since these are not directly observable, we need to proxy for them. Need for external funds will be greater the more investment opportunities are available; the more such opportunities are expected, the greater the firm's net worth. Hence we use net profits as our proxy for net credit needs; we obtain the drift term by averaging this variable's growth, and the standard deviation term by the standard deviation in growth. Other proxies considered for net credit needs include growth of total assets, growth of total liabilities and growth of total sales. External funds are

less needed when more internal funds are available; hence we also control net cash flow and working capital.

$Risk_i$ is the bank lender's evaluated risk rating for firm i. As noted above, Campbell (1978) and Hawkins (1982) argued that firms may use credit line to hedge against its own risk such as credit quality deterioration. To the extent that such deterioration is correlated with current risk characteristics, including a risk rating allows us to test their hypothesis.[8]

$Collateral_i$ is equally important, as using collateral to secure loan commitment can reduce information asymmetric problems (Stiglitz and Weiss, 1981 and 1986) and thus can give a firm more favorable contract price (see e.g., Stulz and Johnson, 1985), such as reducing the usage fee (Shockley and Thakor, 1997)[9]. Hence, the Collateral vector includes dummy variables to distinguish the type (deposits or business assets) of collateral used to secure loan commitments.

We also control for other firm-level characteristics that might affect demand for funds. The vector Age_i represents the number of years that firm i has been in business and the number of years squared. If a younger firm faces more uncertainty about its growth prospects than an older firm, it is more likely to commit to a smaller line and use less of its line commitment. We also include industry (SIC_i) and state ($State_i$) specific effects.

4. Data

Our unique dataset comes from a large financial institution that issues lines of credit to both public and private firms. For this paper, we restrict our sample to private firms with fewer than 500 employees (which can be classified as small to medium size enterprises, or SMEs), since public firms have several other sources for project financing such as public debt and equity financing. Our dataset has independently audited quarterly balance sheet data from 1998:Q1–2002:Q4, and internally maintained monthly loan performance information from 2001:Q1–2002:Q4 for 712 private firms.

[8] Dinc (2000) argues that such concerns by the firms are baseless, since credit market competition will induce banks to keep their lending commitment even when a borrower's credit quality deteriorates in order to maintain a 'good reputation.'

[9] But Strahan (1999) shows that firms using collateral to secure their loans face on average 32-51 percent higher in risk premium spread.

The sample of firms is distributed across seven industries (as defined by a one digit-SIC code). Of the 712 firms, 23.0% are in Trade, 22.6% in Manufacturing (Rubber, Leather, Metal, Machinery, Equipment, and Electronics), 20.8% in Finance, Insurance, and Real Estate, 10.9% in Manufacturing (Textile, Food, Tobacco, Furniture, Printing, and Petroleum), 9.7% in Services (Health, Legal, and Engineering), 4.2% in Services (Hotels, Personal Business, and Auto) and 1.0% in Transportation. The firms are distributed across five states: Massachusetts (23.2%), Connecticut (25.9%), Rhode Island (4.6%), New York (42.2%), and New Jersey (4.2%).

In addition to SIC identification and geographic location information, we observe the terms of the financial contract such as the type of credit lending, credit limit demand, the interest rate on takedowns, the risk premium spread, commitment fees, and overcharge fees for each firm at loan origination (2001:Q1). We also have risk rating by the lender, the type of collateral used to secure the credit line, and the number of years a firm has been in existence. We observe loan performance, which allows us to not only observe the original demand for the line of credit, but also the subsequent usage of the line over a two-year period.

We observe balance sheet information both prior to (1998:Q1–2000:Q4) and during (2001:Q1–2002:Q4) the period the lines of credit were in use. These two time periods are crucial to our study since they provide us with the firms' growth and volatility for a three-year period prior to loan origination as well as the firms' growth and volatility for a two-year period after line origination. Unless otherwise stated, we do not use the balance sheet data after the line origination since doing so would create endogeneity problems with credit line and line utilization.

Table 2 provides summary statistics on characteristics and balance sheet information of our firm sample. The mean age of the firms is about 9.5 years. The firms on average hold just above $2 million in total assets, have about $600,000 in working capital and a ratio of cash flow to last period's total liabilities of 14.08. Their liquidity position (i.e., firm's ability to have sufficient cash to meet current and future needs), measured by the current ratio is about 1.9, while current profitability potentials, as measured by the return on equity, are about 26 percent. Firms' average risk rating (on a

scale of 1 to 8, with 1 being the least risky) is about 5. Our sample firms face a multi-tiered pricing structure. Firms incur an average of $1,859 of up-front commitment fee, pay an average of 8.5 percent plus a risk premium of 40 basis points on any amount drawn from the credit line, and pay about 2.0 percent on any amount drawn above the prefixed line. To obtain credit lines, 92.8 percent of firms in our sample used collateral to secure the line commitment (17.9 percent used deposits and 74.9 percent use business assets (tangible and intangible) as collateral). The average line commitment for our sample firms is about $1.3 million. Firms' average takedown over the two year-periods is 48.2 percent.

5. Results

Tables 3 and 4 present the results of regressing credit line commitment (relative to firm size) and credit line utilization (total takedown relative to total line commitment) on the explanatory variables defined above. We expect some of the regressors to affect loan demand, and some to affect loan supply. Although we are primarily interested in loan demand, the latter variables are of interest because variation in them helps us identify the loan demand curve. We are confident we have identified this because the variables all have the expected signs and are of reasonable magnitudes. The results support the predictions outlined in Martin and Santomero (1997). We discuss each table in detail below.

5.1 Credit Line Commitment

Firms having to pay higher up-front commitment fees, higher risk premium spreads or higher usage fees commit to a smaller credit line, while firms facing a higher penalty for overrunning their line face commit to a larger credit line. All of the effects are economically large and statistically significant. An increase of one percent in up-front commitment fees (*c* in the model above) decreases the line commitment by 3.8 percent- a surprisingly large amount, given the relatively small average size of the fees. A one percentage point increase in the overcharge fee spread (*s*, the overrun penalty) increases the amount of the credit line by 6.86 percent; one percentage point is large relatively to the average penalty, but is well within the five-percentage point standard deviation. A

one percentage point increase in the interest rate *r* (slightly less than one standard deviation) leads to a 7.64 percent decline in the initial credit line. An increase in the risk premium spread of one percentage point (about two standard deviations) reduces the initial credit line by 19.36 percent.

Proxies for net funding needs also affect credit line demand. An increase in average net profit growth, which we would expect to be positively correlated with future need for funds, of one percent raises credit demand by 13.19 percent. An increase of one percent in the standard deviation of net profit growth (which we would similarly expected would be positively related with the standard deviation of net funding needs) lowers credit demand by 13.22 percent. An increase in net cash flow of one percent lowers demand for credit by 2.34 percent- with the right sign (since internal funds should reduce the net need for funds), but small. Having more working capital paradoxically raises credit line demand- though perhaps because working capital may be a predictor for future funding needs.[10] The net funding needs variables, as a group, have a larger effect on credit demand than any of the other explanatory variables.

An increase of one point on the risk rating (on an eight point scale of increasing risk) lowers credit demand by about 1.5 percent. From Campbell (1978) and Hawkins (1982) we would have expected that firms fearing reductions in credit ratings would have demanded more credit. The findings here do not support that idea, if we assume that already riskier firms fear deterioration relatively more. However, there are two other possibilities that may imply that these results are not inconsistent with Campbell and Hawkins. First, it is possible that relatively less risky firms fear credit deterioration more, or pay relatively higher costs when their credit deteriorates. Second, firm riskiness may affect credit supply in ways not fully captured by the risk premium.

The use of collateral not surprisingly increase the equilibrium amount of credit- more so when collateral is in the form of deposits than with business assets. As with the risk measures, this is more likely to be a supply effect than a demand effect.

We also include, but do not report, other measures of firm characteristics which might affect credit demand. Younger firms hold higher lines of credit- perhaps because

[10] We also used other objective measures of firm growth such as growth of total assets, total liabilities, and total sales in our regression; however, the results were qualitatively the same.

they fear deterioration in credit worthiness; each additional year in business increases credit demand by about two percentage points. Firms whose one-digit SIC classification places them in the trade, finance, insurance and real estate, or service sectors have larger credit lines than those in mining and construction or manufacturing. There is no substantial variation by state location.

5.2 Credit Line Utilization

Conditional on having chosen the size of the credit line, utilization should reflect the realization of stochastic investment opportunities. But when firms must repeatedly choose lines, usage should also influence the timing of such choices and the size of the line. If firms employ lines because it gives them the flexibility to take advantage of investment opportunities that would otherwise disappear, they should take out new lines before the current line is used up. We frequently observe this in our data: firms convert the unused portion of the credit line into a spot loan and take out a new line.

Since utilization and the size of the line may therefore be jointly determined, we run the same regression as in Table 3, replacing the size of the line with utilization (measured as a two-year average of total takedown relative to total credit line). The results, reported in Table 4, are generally in line with expectations and the results reported in Table 3.

We find that higher up-front commitment fees are associated with greater usage of credit lines; a one percent increase in such fees raises utilization by 3.5 percent. This may reflect a selection effect; firms willing to pay higher fees to establish credit lines may also be in industries in which investment opportunities arise more frequently. Overcharge fees have only a small and statistically insignificant effect on usage. Increases in interest rates and risk premium spreads lead to lower utilization rates, but the effects are much smaller than for the size of the lines.

The average and standard deviation of net profit growth affect utilization in the expected manner- the former increasing it (by 13 percent for each percentage point increase), the latter decreasing it (by 12 percent for each percentage point increase). Cash flow and working capital have negligible effects on usage- possibly because, conditional

on having obtained the line, it is less costly using external funds (which must be paid for whether or not used) than internal funds.

Riskier firms use smaller amounts of their lines; each increase in risk category decreases line usage by over 2.5 percent. This may be consistent with the hypothesis that riskier firms are reluctant to use their credit, for fear that credit will be more costly or unavailable if their condition deteriorates further.

Collateral has a large but statistically insignificant effect on usage. There is also no economically or statistically significant variation in utilization by age of the firm, industrial classification or state location.

6. Conclusion

There are several competing explanations for the existence and use of credit lines: hedging against deterioration in creditworthiness, hedging against credit rationing or credit crunches, solving moral hazard and adverse selection problems in spot market borrowing, or providing speed and flexibility to enable firms to take advantage of investment opportunities. Though a number of papers have looked at the determinants of the supply of credit lines, few have looked at demand. The latter uniformly look at publicly-traded firms; the large menu of financing options available to such firms makes it difficult to make or test predictions about their choice of credit lines.

In this paper, we avoid these problems by looking at the demand for credit lines by privately-held firms. We use Martin and Santomero (1997)'s model, in which credit lines provide speed and flexibility to firms, to develop testable predictions. Our findings are consistent with their predictions. Firms facing higher up-front commitment fees, risk premium spreads or usage fees have smaller credit lines, while those with higher overrun fees have larger ones. Firms with greater profit growth in the past have higher lines, while those with more internal funds or higher volatility in profit growth have smaller lines. The results for line utilization are quite similar. We also find that firms rarely exhaust their credit lines; rather, the unused portions of such lines are converted into spot loans, and firms take out new lines.

This last finding suggests there is a dynamic interaction between line size and usage; it would be of interest to model this relationship and develop new predictions. By

providing estimates of loan demand, the results of this paper may also be useful in disentangling the effects of demand from supply that have plagued macroeconomic studies of the impact of shocks to bank loan supply.

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Table 1: Distributions by Industries, States, and Collateral Types

Panel A: Industry Distribution	Distribution
Mining & Construction	8.06%
Manufacturing (Textile, Food, Tobacco, Furniture, Printing, Petroleum)	10.75%
Manufacturing (Rubber, Leather, Metal, Machinery, Equipment, Electronics)	22.58%
Transportation	1.08%
Trade	23.01%
Finance, Insurance, and Real Estate	20.81%
Services (Hotels, Personal and Business Services, Auto)	4.04%
Services (Health, Legal, Engineering)	9.68%
Panel B: State Distribution	Distribution
MA	23.19%
CT	25.86%
RI	4.56%
NY	42.21%
NJ	4.18%
Panel C: Collateral Type Distribution	Distribution
No Collateral	7.22%
Business Assets Tangible and Intangible	74.90%
Deposits	17.87%

Notes: The total number of firms in our sample is 712. These distributions are at account origination.

Table 2: Summary Statistics

Variable	Mean	Std. Dev.
Total Exposure	$1,029,998	$1,000,874
Total Assets	$2,002,240	$1,543,320
Line Commitment (Exposure/Assets)	52.98%	28.23%
Utilization (%)	48.21%	49.23%
Commitment Fee	$1,859	$359
Interest Rate on Takedown	8.47	1.51
Risk Premium Spread	0.4	0.53
Overcharge Fee Spread	2.04	5.16
Net Profit Growth (%)	19.28%	5.49%
Net Sales Growth (%)	21.05%	1.28%
Total Assets Growth (%)	11.37%	47.90%
Risk Ratings	5.04	0.92
Net Cash Flow	$160,315	$137,687
Working Capital	$600,076	$567,800
Years in Business	9.46	6.88
Number of Firms	712	

Table 3: Demand for Credit Lines

Intercept	108.48**
	(24.28)
Price	
Log (Commitment Fee)	-3.84**
	(1.18)
Overcharge Fee Spread	6.86**
	(2.95)
Interest Rate	-7.64**
	(3.17)
Risk Premium Spread	-19.36**
	(7.79)
Net Funding Needs	
Mean Net Profit Growth	13.19**
	(5.07)
Standard Deviation of Net Profit Growth	-13.22*
	(5.54)
Log (Net Cash Flow)	-2.34**
	(1.02)
Log (Working Capital)	7.03*
	(3.49)
Risk	
Risk Rating	-1.48*
	(0.73)
Collateral	
Collateral (Deposits)	19.44*
	(8.91)
Collateral (Business Assets)	3.75
	(2.63)
Firm Characteristics Included	
Years in Business	
SIC Dummies	
State Dummies	
Adjusted R-Squared	0.67
Number of Observations	712

Notes: This table reports the results of an OLS regression of credit line commitment (total exposure/firm size) on measures of price, net funding needs, risk, collateral, age, and firm characteristics (not reported). Heteroskedasticity-robust standard errors are in parentheses. The price measures consist of commitment fees (log thousands of dollars), overcharge fee spread, interest rate and risk premium spread (all in percentage points). Net funding needs are represented by the mean and standard deviation of net profit growth (percent growth), net cash flow and working capital (both log thousands of dollars). Risk rating is measured on a scale of 1-8, where 8 represents the highest risk. Collateral is measured by a dummy variable for each type. All percentage and growth rate figures expressed as decimals.
* Denotes statistical significance at a 95% confidence level, ** at a 99% level.

Table 4: Usage of Credit Lines

Intercept	-123.73*
	(46.17)
Price	
Log(Commitment Fee)	3.56**
	(1.32)
Overcharge Fee Spread	1.54
	(0.98)
Interest Rate	-2.45**
	(0.99)
Risk Premium Spread	-8.25*
	(3.94)
Net Funding Needs	
Mean Net Profit Growth	12.97*
	(5.93)
Standard Deviation of Net Profit Growth	-12.38*
	(6.17)
Log(Net Cash Flow)	-0.93
	(0.64)
Log(Working Capital)	-1.76*
	(0.84)
Risk	
Risk Rating	-2.63*
	(1.32)
Collateral	
Collateral (Deposits)	8.11
	(6.63)
Collateral (Business Assets)	5.29
	(9.64)
Firm Characteristics Included	
Years in Business	
SIC Dummies	
State Dummies	
Adjusted R-Squared	0.41
Number of Observations	712

Notes: This table reports the results of an OLS regression of credit line usage (a two-year average) on measures of price, net funding needs, risk, collateral, age, and firm characteristics (not reported). Heteroskedasticity-robust standard errors are in parentheses. The price measures consist of commitment fees (log thousands of dollars), overcharge fee spread, interest rate and risk premium spread (all in percentage points). Net funding needs are represented by the mean and standard deviation of net profit growth (percent growth), net cash flow and working capital (both log thousands of dollars). Risk rating is measured on a scale of 1-8, where 8 represents the highest risk. Collateral is measured by a dummy variable for each type. All percentage and growth rate figures expressed as decimals.
* Denotes statistical significance at a 95% confidence level, ** at a 99% level.