ARE THERE "BANK EFFECTS" IN BORROWERS' COSTS OF FUNDS?: EVIDENCE FROM A MATCHED SAMPLE OF BORROWERS AND BANKS

by

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ABSTRACT

We use a large matched sample of individual loans, borrowers, and banks to investigate whether bank financial health affects terms of lending, holding constant proxies for borrower risk and information costs. In particular, we focus on measuring effects of borrower and bank characteristics on loan interest rates; we also investigate implications of borrower and bank characteristics for indirect measures of credit availability.

Our principal findings are six. First, even after controlling for proxies for borrower risk and information costs, the cost of borrowing from low-capital banks is higher than the cost of borrowing from well-capitalized banks. Second, this cost difference is traceable to borrowers for which information costs and incentive problems are *a priori* important. Third, weak bank effects on the cost of funds are higher in periods of aggregate contractions in bank lending. Fourth, estimated weak bank effects remain even after controlling for unobserved heterogeneity in the matching of borrowers and banks. Fifth, weak bank effects are quantitatively important only for high-information-cost borrowers, consistent with models of switching costs in bank-borrower relationships and with the underpinnings of the bank lending channel of monetary policy. Sixth, when we investigate determinants of cash holdings of borrowing firms, we find that firms facing high information costs hold more cash than other firms, all else being equal, and those firms (and only those firms) have higher cash holdings when they are loan customers of weak banks. These results suggest declines in banks' financial health can lead to "precautionary saving" by some firms, a response which may affect their investment spending.

This evidence sheds light on two sets of questions. First, our estimated effects of bank characteristics on borrowing cost are consistent with models of switching costs for borrowers for whom banking relationships are most valuable. Second, our findings are consistent with switching costs for the borrowers stressed by the "bank lending channel" of monetary policy.

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I. INTRODUCTION

Empirical researchers in macroeconomics and corporate finance have long been interested in effects of changes in bank loan supply on borrowers' costs of funds and hence on a variety of "investment" decisions by borrowers (see, *e.g.*, Roosa, 1951). This interest has come to the forefront in policy discussions of the "credit crunch" in the United States in 1991 and the "capital crunch" for Japanese banks in 1998. To the extent that a borrower faces switching costs in a relationship with an individual bank, bank-specific financial health might affect a borrower's cost of funds, even controlling for observable characteristics relating to borrower risk. To the extent that certain borrowers face differentially costly external financing from nonbank as opposed to bank lenders, shifts in the ability or willingness of banks to lend can affect these borrowers' cost of funds and investment.

Sources of a special role for banks in the credit allocation process have been widely explored. Indeed, the existence of bank-like financial intermediaries is generally explained by informational asymmetries that lead to costly frictions in the allocation of capital (see, *e.g.*, Diamond, 1984, 1989, 1991; and Ramakrishnan and Thakor, 1984). In this line of inquiry, the relative importance of private financing for firms depends on the magnitude of information costs in acquiring external financing.[1] That is, the role for financial intermediaries in financing investment is most pronounced when high information costs create a significant wedge between the cost of internal and external financing (see, *e.g.*, Bernanke, 1983; and Fama, 1985). While there are significant bodies of research on effects of firm

[1] Perhaps less well understood are costs associated with reliance on banks, including regulatory taxes (Fama, 1985), information monopoly power (Sharpe, 1990; and Rajan, 1992), and costs of lender control (Diamond, 1994).

balance sheet positions on firm investment decisions and on effects of bank balance sheet positions on bank lending decisions, empirical work linking bank and borrower variables has been much more limited.

One strand of research offers indirect evidence on the real decisions of bank-dependent borrowers. Using firm-level data for Japan, Hoshi, Kashyap, and Scharfstein (1993) conclude that investment is less sensitive to cash flow for firms that are members of a *keiretsu*. Also using Japanese data, Gibson (1995) finds that firm investment is sensitive to the financial health of the firm's main bank, holding constant *Q* and cash flow (as proxies for investment opportunities and costly external financing). Using data on small U.S. firms, Petersen and Rajan (1994) and Berger and Udell (1995) estimate that a close bank relationship increases credit availability for small borrowers. Using data on larger, publicly traded U.S. firms, Houston and James (1995) find that firms relying on a single bank lender have a much greater sensitivity of investment to cash flow than firms with multiple bank relationships or which borrow in public debt markets. They also estimate that firm-level sensitivity of investment to cash flow increases in a firm's reliance on banks for debt financing.

Another body of research has concluded that replacing banking relationships is costly. James (1987) finds that on announcement of a bank loan, firms earn positive abnormal returns.[2] Similar in spirit to this paper is that of Slovin, Sushka, and Polonchek (1993), who

[2] While James (1987) finds that all bank loans earn positive abnormal returns, Lummer and McConnell (1989) find that only loan renewals earn positive abnormal returns and loan initiations do not. However, Slovin, Johnson, and Glasrock (1992) show that differentiating between loan initiations and loan renewals is unnecessary, because both types of loans earn positive abnormal returns (only in the case of small firms, not in the case of large firms). Accordingly, we do not control for whether the loan is a renewal or an initiation but whether the firm is small or large.

study the effects of the *de facto* failure of Continental Illinois Bank and its subsequent rescue by the FDIC during 1984 on the share prices of the bank's loan customers. In particular, they conclude that the impending failure led to negative excess returns for firms with a lending relationship with Continental (especially for those lacking a relationship with another bank), while the rescue led to positive excess returns for those firms. We employ a larger sample of banks and firms than do Slovin, Sushka, and Polonchek, and, more important, control for firm characteristics related to borrower-specific operating risk and scope for moral hazard.

We attempt to bridge the gap in existing research by matching data on terms of individual loans with information on the borrower and bank lender in the transaction. This matching allows us to investigate whether, holding constant proxies for borrower risk and information costs, bank liquidity or capital affects terms of lending. In particular, we focus on measuring effects of borrower and bank characteristics on the interest rate charged to the borrower in the loan; we also investigate implications of borrower and bank characteristics for indirect measures of credit availability.

Our principal findings are six. First, even after controlling for proxies for borrower risk and information costs, the cost of borrowing from low-capital banks is higher than the cost of borrowing from well-capitalized banks. Second, this cost difference is traceable to borrowers for which information costs and incentive problems are *a priori* important. Third, weak bank effects on the cost of funds are higher in periods of aggregate contractions in bank lending. Fourth, estimated weak bank effects remain even after controlling for unobserved heterogeneity in the matching of borrowers and banks. Fifth, weak bank effects are quantitatively important only for high-information-cost borrowers, consistent with models of

switching costs in bank-borrower relationships and with the underpinnings of the bank lending channel of monetary policy. Sixth, when we investigate determinants of cash holdings of borrowing firms, we find that firms facing high information costs hold more cash than other firms, all else being equal, and those firms (and only those firms) have higher cash holdings when they are loan customers of weak banks. These results suggest declines in banks' financial health can lead to "precautionary saving" by some firms, a response which may affect their investment spending.

The paper is organized as follows. Section II describes the data sets we use to match loan, bank, and borrower characteristics. Our empirical tests are reported in section III. Section IV concludes and discusses broader implications of our findings.

II. THE DATA

Our interest in isolating effects of "borrower" and "bank" characteristics on the cost of funds for investment creates a high data hurdle. We require information on loans, borrowers, and banks for each transaction. Our basic source of data is a sample of 11,621 loan agreements with principal amounts totaling $1,895 billion (with an average loan size of $164 million), covering about 4,840 business firms in the United States. The data are taken from the 1993 release of the DEALSCAN database supplied by the Loan Pricing Corporation (LPC),[3] and cover the period from 1987 to 1992.[4] For a given loan, the LPC data record the

[3] Other studies using the LPC data for different purposes include Carey (1995); Carey, Post, and Sharpe (1998); and Beim (1996).

[4] In general, the loan agreements in the DEALSCAN database cover a significant fraction of the dollar value of outstanding consumer and industrial loans (see Carey, Post, and

identity and location of the borrower; the purpose, contract date, type, and amount of the loan;[5] the identities of the lenders (for our purposes, U.S. banks) party to the loan at origination; and price and some nonprice terms. Almost all (97 percent) of the loans are floating-rate. To obtain more information about borrower characteristics, we matched the firms in LPC with COMPUSTAT. To obtain more information about bank characteristics, we match the banks in LPC (that is, the lead bank for a given loan) with the Federal Reserve Call Report data.[6]

We use as a measure of the cost of funds the "drawn all-in spread" — defined as "coupon spread plus annual fee + (upfront fee/maturity)" — reported by Loan Pricing Corporation. The spread is measured against LIBOR. For loans priced using interest rates other than LIBOR, a constant average differential is added over our period: +205 basis points for the prime rate, –19 basis points for the commercial paper rate, –125 basis points for the Treasury bill rate, –25 basis points for the federal funds rate, –12 basis points for the bankers' acceptance rate, and –9 basis points for the rate on negotiable certificates of deposit.

The all-in spreads appear to be reasonable measures of the premium over LIBOR charged to borrowers. Using the LPC data, Carey (1995) compares the all-in spreads on bank loans to the spreads on bonds, controlling for maturity and credit ratings. After adjusting for

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Sharpe, 1998).

[5] Some of the loan packages incorporated multiple "facilities" originated by the borrower on that date. Our empirical analysis is at the level of the facility because loan packages with more than one lender do not necessarily involve all lenders in all facilities, and because the spread depends largely on facility-specific attributes.

[6] We lose observations when LPC does not report the loan spread or whether the loan is secured and when we cannot match the loan transaction data to the Call Report data or COMPUSTAT.

collateral and maturity (using matched LPC data and bond rating data), he finds no statistically significant differences in loan and bond spreads. Carey also finds that the presence of collateral is associated with higher all-in spreads, even after controlling for the borrower's rating, an issue to which we return below.

Before investigating empirically effects of borrower and bank characteristics on the cost of funds, we begin by documenting patterns for all-in-spreads (*AIS*) in loan interest rates, loan maturity, bank size, firm leverage, use of collateral, and bank capital-asset ratios across borrower-size groupings (measured by sales). As Panel A of Table 1 shows, smaller borrowers tend to have higher all-in spreads, shorter-term loans, a greater likelihood of secured loans, and somewhat greater leverage than larger borrowers. In addition, smaller borrowers tend to be the loan customers of smaller banks. As Panel B of Table 1 shows, smaller borrowers generally borrow from smaller, more well-capitalized banks, suggesting that to isolate a link between bank financial weakness and terms of lending, we will need to control for borrower and bank characteristics.

III. BORROWER CHARACTERISTICS, BANK CHARACTERISTICS, AND THE COST OF FUNDS

Absent informational frictions, in a competitive loan market, the loan interest rate charged by a bank to a borrower should reflect the bank's cost of funds and the risk characteristics of the borrower. Shifts in borrower risk will affect the risk premium in the loan rate. Bank-specific increases in the cost of funds would not be passed on to loan customers in the absence of informational or competitive frictions; borrowers could simply

switch banks. With informational frictions, this simple loan pricing story changes in three ways. First, proxies for borrower information costs and incentive problems may influence the cost of funds to the borrower. Second, to the extent that the bank-borrower relationship reduces information and incentive costs relative to other forms of financing, borrowers face switching costs in changing lenders; hence an idiosyncratic increase in the bank's cost of funds (say, from a decrease in capital or balance sheet liquidity) could increase the cost of funds to borrowers.[7] Third, in the presence of information and incentive costs, the loan contract may involve non-price-clearing mechanisms — *e.g.*, denial or rationing of credit to certain borrower groups. In this case, the true shadow cost of funds to borrowers could be affected by changes in bank financial health even if the loan interest rate is not affected; we return to this issue of "quantity effects" in section III C below.

A. How Can One Measure Bank Effects?

Our empirical tests for the role of bank and borrower characteristics in explaining the cost of funds take the form:[8]

$$AIS_{ij\ell t} = \alpha_i + \beta_j + \kappa_t + \gamma X_{ij\ell} + \lambda R_{it} + \omega I_{it} + \delta B_{jt} + \epsilon_{ij\ell t} \quad , \tag{1}$$

where i, j, ℓ, and t index, respectively, the borrower, bank, loan, and time. X represents nonprice loan characteristics; R represents proxies for borrower risk; I represents proxies for

[7] Alternatively, a lower capital-assets ratio can impair a bank's ability to extract repayment, leading to a lower recovery rate in default and a higher credit risk premium (see Diamond and Rajan, 1999).

[8] One can think of equation (1) as a reduced form of a loan demand and a loan supply equation, where R, I, and B represent exogenous shifters.

borrower information costs and incentive problems; B represents bank characteristics; κ denotes year dummies; ϵ is an error term. In some specifications, we allow for fixed borrower effects (α_i) or bank effects (β_j) to address the possibility that unobserved heterogeneity affects OLS estimates of γ, λ, ω, and δ.

Problems of unobserved borrower heterogeneity in estimating equation (1) arise for at least two reasons. First, estimating equation (1) using our matched data complicates the interpretation of $\hat{\gamma}$ because the incidence of nonprice provisions (*i.e.*, length of maturity or use of collateral) reflects unobserved heterogeneity among borrowers. For example, banks may require lower levels of collateral or allow longer loan maturity for better borrowers. Second, interpretation of $\hat{\delta}$ — the effect of bank variables on the cost of funds, holding constant observed borrower characteristics — is made difficult by the fact that sorting of borrowers among banks may occur based on private (to the econometrician) information, with weaker borrowers (based on unobserved characteristics) matched to weaker banks, biasing $\hat{\delta}$ upward. We address these concerns in empirical tests below.

For nonprice loan characteristics (X), we include maturity, facility size, a dummy variable equaling unity if the loan is linked to the prime rate (and zero, otherwise), whether the loan was part of a revolving credit line (of less than or greater than a year's duration, as defined by LPC), and loan purpose. Initially, we focus only on secured loans; we return to the choice of secured status later. We combine the sixteen stated loan purposes categorized in the LPC data into five groups (see Table A2 in the Appendix), each represented by a dummy variable. These groups include general purposes (*e.g.*, for working capital), recapitalization (*e.g.*, for debt consolidation or repayment, or specific recapitalization),

acquisition (*e.g.*, for general or specific acquisition programs), leveraged buyout, and miscellaneous (*e.g.*, for trade finance, real estate loans, project finance, commercial paper backup, stock buyback, and securities purchase).[9]

We group borrower characteristics into two types, associated with observable measures of risk (R) and with proxies for information and incentive costs (I). In the former group, we include the firms's bond rating, the debt-asset ratio, the current ratio (*i.e.*, Current Assets/Current Liabilities), the quick ratio (*i.e.*, (Cash + Marketable Securities + 0.6 × Accounts Receivable)/Current Liabilities), and the interest-to-sales ratio, and one-digit-SIC-industry dummies. Our proxies for information or control problems include three-year sales growth (*i.e.*, over the previous three years), the R & D-to-sales ratio, and Tobin's Q (defined as (Short-term Debt + Long-term Debt + Market Value of Common Equity + Book Value of Preferred Equity)/Book Value of Total Assets).

Finally, our bank characteristics (B) include size (log of lender assets), percentage of loans past due, capital-asset ratio, a dummy variable equaling unity if bank equity is less than 5.5 percent of assets (and zero, otherwise), the net loan chargeoff percentage, and bank liquidity (as measured by the ratio of cash and securities to total assets; *cf.* Kashyap and Stein, 1995, 1997). In addition, we include a dummy variable equal to unity if the bank is not located in a MSA (and equal to zero, otherwise), and, for banks in MSAs, the Herfindahl index for the MSA.

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[9] These categories differ somewhat from those used by Carey, Post, and Sharpe (1998), as we describe in the Appendix.

In Table 2 we present our basic specifications modeling the all-in spread as a function of loan, borrower, and bank attributes (the regressions in Table 2 also include year dummies). Four patterns in Table 2 are noteworthy. First, the estimated coefficient on the loan maturity variable is negative and statistically significant in all of the specifications. All else being equal, longer-maturity loans are associated with lower all-in spreads. It is likely that maturity reflects unobserved heterogeneity — banks are willing to make longer maturity loans to better borrowers; we explore this possibility in greater detail below. Second, all else being equal, prime loans have significantly higher all-in spreads than non-prime loans.[10] Third, after controlling for loan and borrower characteristics, bank loan size has no statistically significant effect on all-in spreads on loans. Fourth, even after controlling for borrower characteristics, loans from low-capital banks carry modestly higher all-in spreads.[11,12] This effect is a lower bound of the true "weak bank" effect on the borrower's cost of funds because we are measuring the loan interest rate, not the shadow cost of the loan (a point to which we return later). Our basic evidence is consistent with Lown and Peristiani (1996), who find that,

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[10] The average facility size for prime loans is significantly smaller than that for non-prime loans for all types and purposes of loans.

[11] This finding is consistent with the analysis of Peek and Rosengren (1997), who focus on loan volume. They conclude that U.S. branches of Japanese banks cut back lending when their parent firm's capital position weakened. Similarly, Ito and Sasaki (1998) find that Japanese banks whose capital positions were constrained by the Basel risk-based capital standards reduced their volume of lending.

[12] Though not reported here, "weak bank" effects are much smaller for the sample of only unsecured loans, suggesting that borrowers with high costs of switching banks may be more likely to borrow on a secured basis, a possibility we explore below.

during the 1990 credit slowdown, large, undercapitalized banks charged a higher-than-average loan rate to consumers relative to better-capitalized institutions.[13]

We probe these findings further in Table 3, by examining whether loan, borrower, and bank effects vary by year or by bank capital threshold. The first two columns report estimates in which the low bank capital effect is allowed to vary by year. Again, the statistically significant estimated negative coefficients on "maturity" point up the importance of unobserved borrower heterogeneity in periods of aggregate contraction in bank lending. The effect of weak banks (as measured by a capital-asset ratio less than 0.055) on spreads is traceable principally to two years, 1988 and 1989, the latter year being a period of contraction in bank lending (see, *e.g.*, Friedman and Kuttner, 1993). Using "switching cost" intuition, these may have been periods in which switching costs were high, thereby not permitting borrowers to switch to other lenders when relatively weak lenders raised spreads.

The remaining three columns of Table 3 examine potential nonlinearities in the effect of bank capital on spreads. When we divide the bank capital variable into three ranges (less than 0.045, between 0.045 and 0.050, and between 0.050 and 0.055), the estimated coefficients, reported in the third column, do not suggest the presence of significant nonlinearities in the bank capital effects (though the standard errors are large).

As an alternative way to capture possible nonlinearities, we estimated a version of our basic equation in which the capital-asset ratio, k, entered through a logistic function,

[13] Lown and Peristiani were not, however, able to control for differences in borrower characteristics across banks.

$$g(k;\phi,\mu) = \frac{e^{\phi(\mu - k)}}{1 + e^{\phi(\mu - k)}},$$

which is defined so that as $k \to 0$, $g(k) \to 1$, and so that as $k \to \infty$, $g(k) \to 0$. In the fourth column of Table 3, we report estimates of the logistic location parameter (μ) the scale parameter (ϕ) and a coefficient on $g(k)$ using nonlinear least-squares. In principle, such a specification allows the data to determine both the "threshold" below which banks start charging higher spreads, and the speed with which the effect materializes. The estimates of μ and ϕ are 3.4 and 1.4, respectively, and the estimated coefficient on the g function is about 55, implying an effect of 27.5 basis points when the capital-asset ratio is 3.4 percent. The estimated value of ϕ of 1.4 implies a relatively gradual transition for g from zero to unity. All three parameters are imprecisely estimated, however, giving further support to the idea that the data are relatively uninformative about nonlinearities in the relationship between the spread and the banks capital-asset ratio.

Finally, the results in the fifth column of Table 3 correspond to the case in which the constraint that ϕ=5 is imposed, implying a relatively sharp transition for g from zero to unity. The estimated location parameter for μ is 5.24 (with a standard error of 0.39), which is close to the value of 5.5 we used in the dummy variable specification.

If switching costs for information-intensive borrowers explain the link between bank balance sheets and interest rates on loans, then one would expect the relationship to be strong only for relatively weak borrowers. To investigate this prediction, we split the sample into

groups of borrowers based on three classification schemes designed to identify high-information-cost borrowers, by whether the: (1) firm has a bond rating (following Gilchrist and Himmelberg, 1995, 1998); (2) firm is "small" or "large" (following Gertler and Gilchrist, 1994) — where small firms are those in the bottom third of the sample ranked by sales or by market capitalization; or (3) borrower is prime-dependent (*i.e.*, following Beim, 1996, those borrowers whose loans are all priced using the prime rate). As Table 4 shows, these alternative switching-cost proxies are related. Unrated borrowers are much more likely to be small or prime-dependent than rated borrowers. Small borrowers are much more likely to be unrated or prime-dependent than large borrowers; we obtain similar results when we categorize borrower size using assets or sales. Prime-dependent borrowers are much more likely to be unrated or small than other borrowers.

We report results for this consideration of differential bank effects in Table 5. Weak banks — measured by low capital relative to assets — are associated with higher all-in spreads for unrated borrowers, for small borrowers, and for prime-dependent borrowers, and not for the complementary sets of borrowers. The estimated negative relationship between loan maturity and the all-in spread can be attributed entirely to the former sets of borrowers. These findings support the existence of switching costs in bank financing for certain groups of borrowers.

Thus far, we have reported results only for the sample of secured loans. In practice, of course, lenders and borrowers choose "price" (*i.e.*, all-in spread) and "nonprice" (*e.g.*, collateral) simultaneously. In Table 6, we reestimate the basic specifications reported in Table 2 with the addition of a dummy variable equaling unity if the loan is secured. The

results presented earlier in Table 2 carry over. In particular, all else being equal, weak banks are associated with higher all-in spreads. It is not the case that the sample for which the secured/unsecured distinction is available in the data drives the bank capital results. As the last three columns of Table 6 illustrate, when one includes a dummy variable equal to unity when the secured data are missing (and equal to zero, otherwise), the estimated bank capital effect is qualitatively similar to that estimated from the sample for which the secured/unsecured distinction is available. Interestingly, the estimated coefficient is higher on the secured dummy variable, suggesting a higher all-in spread for secured than for unsecured loans.

One possibility, of course, is that secured-unsecured differential in the pooled regressions reflects a "between" difference — that is, secured and unsecured borrowers are different. Sources of "between" differences include variation in operating risk and in the severity of information or incentive problems. For example, because banks can observe potential borrowers' operating risk, banks may require that collateral be pledged by riskier borrowers. Alternatively, sorting may occur based on private information, in which case low-risk borrowers are more willing to post collateral. To investigate the possibility of significant "between" variation, we first report some simple probit models for whether the loan is secured; see Table 7. All else being equal, secured borrowers are likely to be prime-dependent and small; bank characteristics have no statistically significant effect on the likelihood of collateral.

To pursue the "between" versus "within" differences more rigorously, we need to estimate a spread regression using panel-data techniques. Data requirements for such a test

are high, however, as we must isolate "within" variation in the use of collateral for a given borrower (including α_i in equation (1)). We are able to estimate such a model for a small sample of transactions (95), using a parsimonious specification; see Table 8. The estimated within effect of the secured dummy variable is now either negative (when other loan variables are excluded) or statistically insignificantly different from zero (when other loan variables are included). The positive estimated effect in the pooled regression is traceable entirely to the between effect. This finding is similar in spirit to that of Berger and Udell (1990), who, using data from the Federal Reserve's Survey of Terms of Bank Lending, conclude that there is a positive relationship between collateral and risk (and, hence, spreads). We are, however, able to control for more borrower-specific measures of risk and information costs. Our results, combined with those presented in Table 6, suggest that our estimated coefficients for effects of loan, borrower, and bank characteristics on all-in spreads offer a reasonable baseline for analysis.

We could improve further on these observations if our data contained a valid instrument for collateral — *i.e.*, a variable correlated with collateral, but not with the unobserved component of firm-specific risk.) One possibility would be to focus on the type of loan (recall the categories outlined in section III). If loan type were independent of firm-specific risk, it would be possible to estimate the direct effect of collateral on "price." Replacing collateral with a probability of the loan's being secured, one would find that the spread between loan rates on secured and unsecured loans is greater for those loans more likely to be unsecured; further, loan types with a lower likelihood of being secured would have a higher spread, unconditional on the presence of collateral.

Unfortunately, this instrumental variable strategy is more difficult to carry out in practice. While it is true that some kinds of loans (*e.g.*, "recapitalization") are secured much more frequently than others (*e.g.*, "general corporate purposes") and that loan categories that are secured most often have the smallest difference between rates on secured and unsecured loans (*e.g.*, two basis points for "recapitalization" versus 124 basis points for "general corporate purposes"), it is not true that the average spread on "less often secured" loans is greater than the average spread on "more often secured" loans. Hence relying on an instrumental variable strategy in which borrower type is independent of loan type is inappropriate.

B. How Important Is Unobserved Borrower Heterogeneity?

One advance in this study is the explicit control for borrower, bank, and loan characteristics. As we described earlier, however, there is still likely to be unobserved borrower heterogeneity in our sample. Returning to the analysis of "bank effects" on borrowers' costs of funds, the question naturally arises as to whether unobserved borrower heterogeneity (α_i in equation (1)) may explain the attachment of weaker borrowers to weaker banks, thereby biasing upward the estimated importance of bank effects on loan spreads.

In principle, one could examine whether, for a given bank-borrower match, a change in the bank's capital-asset ratio affects the all-in spread. By controlling for other borrower and loan characteristics at the same time, this "within" test offers a cleaner examination of bank effects in the cost of funds. In practice, such a test poses a significant data hurdle. Once we restrict the sample of those firms borrowing repeatedly from a given bank and we

match the loan data to the Call Report data for the banks and COMPUSTAT data for the borrowers, about 289 observations remain.

As Table 9 shows, the within estimate of the impact of low bank capital on the spread is statistically insignificantly different from zero for this sample of firms. However, if we split the sample by small versus large borrowers (using the same definitions of these groups as before), or by prime-dependent borrowers versus non-prime-dependent borrowers, a clear pattern emerges. Bank effects are statistically significant and economically important only for the prime-dependent and small-firm subsamples. Hence, as is the case for the earlier tests, bank effects are present for borrowers which *a priori* face greater costs of switching lenders.

C. How Important Are Bank Effects?

Results from our matched sample of loans, borrowers, and banks suggest strongly that certain groups of borrowers face a higher cost of funds when their bank is weak. Returning to Table 5, the cost differential is estimated to be as high as about 40 basis points; the estimate in Table 9 is as high as 124 basis points. The "weak bank" differential is related to borrower switching costs, given that we have controlled for other loan, borrower, and bank characteristics. Is the differential "large" or "small?" Absolutely, the effect on the real cost of funds is smaller than that generated by an increase in safe real interest rates following a monetary contraction. However, even 50 basis points still represents a nontrivial increase in the cost of funds. In our sample of loan transactions, the average real cost of funds is 5.15 percent, so that a 50-basis-point premium represents an increase of almost 10 percent. Given a short-run elasticity of a firm's investment rate with respect to the user cost of capital of

–0.7 (see Hassett and Hubbard, 1997), this implies an estimated "weak bank" effect on borrowers' investment rates of about $0.7 \times 2.5 = 1.75$ percent.[14]

This estimated bank effect on borrowers' costs of funds and "investment" expenditures is a lower bound of the likely impact of switching costs on the cost of funds for two reasons. First, our data only present information on the intensive margin on variation in loan interest rates for borrowers which obtained loans. Customers of weak banks who are denied loans are not observable to us; the true impact of switching costs would pick up this extensive-margin effect as well. To the extent that such borrowers are denied bank credit and have no access to other sources of external funding, investment decisions may be distorted. Hassett and Hubbard (1998) note based on survey evidence that, all else being equal, firms citing high costs of obtaining external financing use higher "hurdle rates" for investment projects than other firms. Gertler and Hubbard (1988) find that investment of smaller firms is excessively sensitive to cash flow during recessions, and Kashyap, Stein, and Lamont (1994) conclude that inventory investment is more sensitive to internal funds during periods of credit tightening. Gilchrist and Himmelberg (1998) document that it is small firms and firms lacking a bond rating — the firms on which our tests focus — which account for failures of neoclassical investment models in favor of models in which investment is influenced by financial frictions.

Second, borrowers may invest in costly financial strategies in the presence of switching costs. In particular, in the absence of easily available bank credit firms may use

[14] This calculation assumes a rate of depreciation of 15 percent. The user cost of capital (abstracting from tax considerations and changes in the price of capital goods) is the sum of the real cost of funds and the rate of depreciation.

cash or financial working capital to smooth fluctuations in internal funds and thereby in the cost of external financing (see, *e.g.*, Fazzari and Petersen, 1993; Calomiris, Himmelberg, and Wachtel, 1995; Hubbard, 1998; and Opler, Pinkowitz, Stulz, and Williamson, 1998). Such a use of cash generates a deadweight loss. Using data on U.S. firms from COMPUSTAT, Opler, Pinkowitz, Stulz, and Williamson (1998) find that small firms and low-dividend-payout firms have greater holdings of cash and equivalents relative to total assets, all other things being equal, than larger, high-dividend-payout firms, consistent with a "precautionary saving" story in the presence of costly external financing.

Following Opler, Pinkowitz, Stulz, and Williamson (1998), we examine determinants of firm cash holdings, measured by the ratio of cash and marketable securities to total assets. As explanatory variables, we include *Q*, the log of firm size, cash flow relative to assets, financial working capital relative to assets, earnings volatility in the firm's two-digit-SIC industry, R&D expense relative to assets, a dummy variable equaling unity if the firm pays dividends (and zero, otherwise), a dummy variable equaling unity if the firm's debt is investment grade (and zero, otherwise), and a dummy variable equaling unity if the firm has a commercial paper rating. The results of this exploration are reported in the first column of the top panel of Table 10; year dummies are included, but not reported. Consistent with prior results, we find that, all else being equal, firms for which information and monitoring costs are arguably high — *e.g.*, small firms, non-dividend-paying firms, high-R&D firms, or firms without a commercial paper program — hold more cash relative to assets. Firms appear to engage in a certain amount of "cash smoothing" to finance fixed investment; all else being equal, high cash flow increases cash holdings, and high current investment is associated with

a decline in cash holdings. These results are consistent with the proposition that high-information-cost firms — in our case, the firms most likely to be relatively dependent on bank financing — hold larger stocks of cash reserves to other assets than other firms.

We now investigate the role of *bank health* in explaining cash holdings; see the results presented in the bottom panel of Table 10. As with our previous results, the "weak bank" proxy (a capital-assets ratio of less than 0.055) only marginally affects borrowing firms' cash holdings in the full sample. When we break out groups — small firms, prime-dependent borrowers, and firms which do not switch banks — a different pattern emerges. For these subsamples of "bank-dependent" borrowers, having a "weak bank" lender raises cash holdings, all else being equal; this effect is statistically significantly different form zero in three of the four cases. The impact is also economically important. Given a mean cash-to-asset ratio of 0.11, non-switching customers of weak banks hold cash balances relative to assets about 10 percent higher than other borrowers, for example. This difference suggests that loan customers of troubled banks respond in part by increasing cash holdings. Such a response may be associated with cutbacks in planned inventory investment or fixed capital investment.

IV. CONCLUSIONS AND IMPLICATIONS

Using a matched sample of individual loans, borrowers, and banks, we find significant evidence that certain groups of firms — generally smaller firms or firms with no bond rating — face a higher borrowing cost when their bank has low equity capital. This effect remains after controlling for loan terms, proxies for borrower risk, and proxies for borrower

information costs. We also find a significant weak bank effect on borrowing costs for the same groups of borrowers when we control for unobserved borrower heterogeneity. Finally, we show that, all else being equal, "high-information-cost" firms hold more cash than other firms and hold still more cash when they are the loan customers of weak banks.

We believe this evidence sheds light on two sets of questions. First, the estimated effects of bank characteristics on borrowing costs are consistent with models of switching costs for borrowers for whom banking relationships are most valuable. Small, unrated, and prime-dependent borrowers cannot costlessly substitute among lenders.

Second, our results offer a piece of evidence for the debate over the existence of a "bank lending channel" for monetary policy.[15] The bank lending channel combines the intuition that some borrowers face high information costs in external financing with the assumption that these borrowers depend on banks for external financing or, at a minimum, face high costs of switching from banks to nonbank lenders to obtain funds. In this channel, banks have cost advantages in gathering and monitoring information about the creditworthiness of certain businesses and the behavior of these "bank-dependent" borrowers. Hence a change in banks' ability or willingness to lend affects bank-dependent borrowers' ability to finance desired spending.

Convincing evidence for the bank lending channel must show that bank decisions affect the cost of funds for high-information-cost borrowers, after controlling for borrower characteristics. While there is substantial empirical evidence that monetary policy can affect

[15] For reviews of alternative transmission mechanisms of monetary policy, see Bernanke and Gertler (1995) and Hubbard (1995).

the composition of bank balance sheets (see, *e.g.*, Kashyap and Stein, 1995, 1997; and Gibson, 1996), the bank lending channel also requires that borrowers face switching costs among banks or between bank and nonbank sources of funds. To the extent that such costs are small or bank health simply reflects the health of bank borrowers, then estimated effects of monetary policy on bank balance sheets or of changes in the composition of bank balance sheets on bank lending do not provide conclusive evidence of a bank lending channel for monetary policy. Our evidence is consistent with switching costs for the borrowers stressed by the bank lending channel; our results are also consistent with a link between bank health and borrowers' cash holdings (and possibly investment spending).

While our findings are suggestive, they fall short of a structural analysis of the terms of bank lending and of variation across borrowers in terms of lending. Because of data restrictions, we are unable to examine the dynamics of the bank-firm relationship (in particular, the effect of the length of the relationship on the terms of the loan) and consequences of differences in loan covenants. We view such issues as important avenues for future research. We also view the consequences for lending of shifts in bank balance sheet strength following bank consolidation as an interesting topic for future research.

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TABLE 1

Summary of Loan, Borrower, and Bank Attributes

A. Loan, borrower, and bank attributes by borrower size

Borrower sales ($ million)	Facilities	Maturity	All-in spread (b.p.)	Fraction secured	Leverage	Bank assets ($ billion)	Bank capital ratio (%)
< $20	276	28	312	0.97	0.35	20.7	5.60
$20–50	389	34	272	0.90	0.41	26.3	5.52
$50–125	641	33	237	0.81	0.40	26.3	5.43
$125–500	1007	38	201	0.84	0.44	34.7	5.36
$500–1000	396	46	191	0.81	0.45	45.3	5.46
> $1000	712	45	151	0.84	0.47	57.3	5.18
All	3421	38	213	0.85	0.43	36.2	5.39

B. Borrower and bank attributes by bank size

Bank assets ($ billion)	Deals	Bank capital ratio (%)	Leverage	Sales	Fraction of loans to borrowers with sales:			
					< 50	50–250	250–1000	> 1000
< $5	437	6.81	0.41	300	0.36	0.40	0.19	0.06
$5–20	570	5.65	0.41	444	0.25	0.46	0.20	0.09
$20–50	449	4.96	0.43	574	0.15	0.40	0.32	0.12
$50–75	439	4.63	0.46	1870	0.11	0.27	0.32	0.31
> $75	326	4.86	0.39	2016	0.13	0.29	0.24	0.35
All	2221	5.41	0.42	954	0.21	0.37	0.25	0.17

Notes: In panel A, observations are loan facilities; in panel B, observations are deals. Sales and assets are expressed in 1992 dollars. Firms' leverage is defined as Debt/(Debt+Equity).

TABLE 2

Spread as a Function of Loan, Firm, and Bank Attributes
Secured Loans Only

	(a)	(b)	(c)	(d)	(e)	(f)
Intercept	244.05*	187.76*	195.52*	235.36*	326.90*	117.60
Maturity	–6.34*	–4.78*	–5.23*	–4.71*	2.44	–4.72*
Log of facility size	–2.83	2.09	2.11	2.75	–5.28	2.51
Purpose: recapitalization	24.47*	21.54*	18.38*	18.87*	16.05†	17.47*
Purpose: acquisition	19.97†	25.49*	14.98†	14.37†	15.56	14.60†
Purpose: LBO	120.60*	98.34*	92.89*	92.15*	98.60*	91.84*
Purpose: miscellaneous	–17.69*	–23.55†	–18.40	–19.06	–12.17	–20.00
Type: revolver < 1 year	42.50*	43.52*	47.01*	48.17*		48.90*
Type: revolver ≥ 1 year	–14.69*	–17.89*	–22.32*	–21.59*		–21.44*
Type: bridge loan	120.55*	122.55*	121.81*	125.10*		125.48*
Prime rate dummy	152.53*	153.29*	152.41*	153.94*	145.22*	155.00*
Log of market capitalization	–0.66	–5.38*	–8.04*	–8.06*	–7.07*	–8.25*
Leverage ratio	53.70*	32.06*	13.54	10.40	35.16*	6.95
PP&E-to-asset ratio	–45.34*	–29.66*	–24.06†	–22.44	–33.58*	–23.54†
Current ratio	–5.86	–9.02*	–11.38*	–11.64*	–5.36	–12.34*
Quick ratio	–6.38					
Interest-to-sales ratio	53.22					
Tobin's *Q*	–5.35					
Zero or missing R&D	17.37†					
R&D-to-asset ratio	95.53					
Three-year sales growth	4.80					
Bank equity capital ratio < 5.5%			21.65*	15.65*	16.22*	15.61*
Nonperforming loans, % of assets			11.07*	10.63*	7.25*	11.01*
Log of bank assets			–2.38	–4.10†	–2.56	–4.07†
Loan loss provision, % of assets			–5.97	–7.91†	–5.87	–8.54*
Cash and securities, % of assets			–0.07	–0.14	–0.74*	–0.13
Equity capital, % of assets			4.49			
Bank ROA			–0.20			
Net chargeoffs			–3.53			
Herfindahl index			–36.04			
Bank not in MSA			–2.37			
Bond rating: A– to A+						134.74*
Bond rating: BBB– to BBB+						109.07
Bond rating: BB– through BB+						150.84*
Bond rating: B+ or below						119.09†
Bond rating: unrated						122.79†
Number of observations	951	1460	1239	1257	577	1257
Adjusted R squared	0.5308	0.5153	0.5343	0.5390	0.5378	0.5414

Notes: The * and † symbols denote statistical significance at the 5 percent and 10 percent levels, respectively. Regressions (a), (b), (c), and (d) differ in the variables included. Results in column (e) are for revolvers with maturity of at least one year. Regression (f) also includes firms' debt rating. All regressions also include year and one-digit-SIC dummies. Firm and bank data are from the year prior to the loan.

TABLE 3

Year and Threshold Effects in the
Relationship Between Bank Capital and the Spread

	Year effects		Threshold effects		
	(a)	(b)	(c)	(d)	(e)
Intercept	255.93*	365.50*	241.65*	227.02*	234.37*
Maturity	–4.66*	1.97	–4.60*	–4.67*	–4.70*
Log of facility size	2.13	–5.66†	2.57	2.88	2.76
Purpose: recapitalization	18.40*	14.81†	18.66*	18.87*	19.23*
Purpose: acquisition	14.80†	12.88	14.75†	15.23†	14.28†
Purpose: LBO	90.31*	88.79*	91.26*	92.89*	92.37*
Purpose: miscellaneous	–19.59	–13.04	–19.48	–19.25	–19.07
Type: revolver < 1 year	49.54*		49.00*	48.58*	48.19*
Type: revolver ≥ 1 year	–20.24*		–20.29*	–20.75*	–21.49*
Type: bridge loan	126.22*		126.71*	122.50*	125.07*
Prime rate dummy	153.68*	142.83*	154.41*	154.17*	153.60*
Log of market capitalization	–7.79*	–7.07*	–8.03*	–8.59*	–8.20†
Leverage ratio	10.07	38.02*	10.33	8.96	10.11
PP&E-to-asset ratio	–23.47†	–33.96*	–22.51	–20.97	–21.15
Current ratio	–11.78*	–5.00	–11.59	–11.75*	–11.66*
Nonperforming loans, % of assets	10.68*	8.90*	11.00*	11.03*	10.19*
Log of bank assets	–4.20†	–4.02	–4.47*	–3.22	–3.89†
Loan loss provision, % of assets	–8.08†	–7.94	–8.33*	–11.12*	–7.83†
Cash & securities, % of assets	–0.13	–0.48	–0.08	–0.12	–0.16
Bank capital < 5.5% × 1987	–7.77	18.33			
Bank capital < 5.5% × 1988	25.14†	42.15*			
Bank capital < 5.5% × 1989	26.84†	35.01*			
Bank capital < 5.5% × 1990	0.22	–1.12			
Bank capital < 5.5% × 1991	31.33†	21.98			
Bank capital < 5.5% × 1992	–0.46	–5.68			
Bank capital < 4.5%			17.42†		
Bank capital ≥ 4.5% & < 5.0%			13.24		
Bank capital ≥ 5.0% & < 5.5%			17.37*		
Low capital effect				54.70	16.85*
Logistic location parameter (μ)				3.39	5.24*
Logistic scale parameter (ϕ)				1.38	*5.00*
Number of observations	1247	566	1247	1258	1258
Adjusted R squared	0.5422	0.5418	0.5408	0.5382	0.5381

Notes: The * and † symbols denote statistical significance at the 5 percent and 10 percent levels, respectively. All regressions also include year and one-digit-SIC dummies. Firm and bank data are from the year prior to the loan. All regressions are for secured loans. Column (b) is for revolvers with a maturity of one year or more. Column (d) reports the unconstrained logistic specification; in column (e), the logistic scale parameter is set equal to 5.0.

TABLE 4

Relationship Among Switching Cost Proxies

Subsample	Share that is:				*N*
	Not rated	Low sales	Low market capitalization	Prime dependent	
No bond rating	1.00	0.42	0.41	0.33	1172
Bond rating	0.00	0.03	0.06	0.14	344
Low sales	0.98	1.00	0.69	0.52	498
High sales	0.67	0.00	0.16	0.17	1018
Low market cap	0.96	0.68	1.00	0.54	500
High market cap	0.68	0.16	0.00	0.16	1016
Prime dependent	0.89	0.60	0.63	1.00	431
Not prime dependent	0.73	0.22	0.21	0.00	1085

Notes: "Low" sales and market capitalization corresponds to the bottom third of the sample: $62.26 million for sales, and $34.91 million for market capitalization. "Prime dependent" firms are those with all loans priced relative to the prime rate.

TABLE 5

Spread as a Function of Loan, Firm, and Bank Attributes, Sample Split by Switching Cost Proxies
(Secured Loans Only)

	Rated debt		Sales		Market capitalization		Prime dependent	
	Yes	No	High	Low	High	Low	No	Yes
Intercept	98.58	249.77*	133.84*	447.51*	135.51*	415.00*	135.19*	592.31*
Maturity	–5.31	–4.94*	–2.40	–11.54*	–2.20	–12.01*	–2.06	–13.53*
Log of facility size	–0.70	3.20	4.07	4.20	4.10	2.88	5.29†	–4.31
Purpose: recapitalization	53.99*	11.30	20.58*	7.42	22.83*	11.61	20.79*	17.31
Purpose: acquisition	16.72	14.59	18.83†	5.88	16.39	17.94	10.25	54.80*
Purpose: LBO	148.81	76.37*	101.15*	27.12	100.30*	48.48†	94.10*	63.31†
Purpose: miscellaneous	–1.49	–28.68†	–11.75	–25.56	–10.10	–32.45	–16.03	–6.59
Type: revolver < 1 year	25.07	49.80*	47.52*	47.42*	46.74*	41.61*	59.41*	30.80
Type: revolver ≥ 1 year	–22.62	–20.69*	–21.30*	–24.85*	20.71*	–26.70*	–15.86*	–35.78*
Type: bridge loan	114.24*	123.10*	131.93*	112.24*	128.89*	124.03*	140.85*	112.68*
Prime rate dummy	181.10*	153.01*	151.61*	158.28*	155.77*	146.20*	142.52*	—
Log of market capitalization	–10.73*	–7.11*	–11.37*	–1.92	–10.30*	–0.10	–10.99*	–1.32
Leverage ratio	–1.42	13.39	7.21	40.68†	0.92	39.13	8.25	6.01
PP&E-to-asset ratio	–28.55*	–24.36	–13.56	–41.65†	–1.56	–76.36*	10.62	–69.92*
Current ratio	–13.81	–11.81*	–8.81*	–11.77*	–11.44*	–10.14*	–6.21†	–21.93*
Bank equity capital ratio < 5.5%	–9.74	17.62*	8.81	24.03*	4.92	29.25*	10.00	39.79*
Nonperforming loans, % of assets	11.94†	9.21*	9.47*	13.02*	12.56*	8.78†	14.24*	3.49
Log of bank assets	10.55	–5.23*	–0.08	–8.84†	0.18	–8.42*	–1.64	–7.39†
Loan loss provision, % of assets	–5.22	–8.34†	–6.74	–14.25†	–9.51†	–10.27	–7.91†	–14.28
Cash and securities, % of assets	–0.98	–0.07	0.01	–0.43	–0.04	–0.07	–0.27	–0.03
Number of observations	270	986	824	432	816	440	875	381
Adjusted R squared	0.6002	0.5242	0.5378	0.5220	0.5472	0.4684	0.5233	0.1881

Notes: The * and † symbols denote statistical significance at the percent and 10 percent levels, respectively. Regressions use the specification from column (d) in Table 2, with the sample split according to the given criterion. "Low" sales and market capitalization corresponds to the bottom third of the sample: $62.26 million for sales, and $34.91 million for market capitalization. "Prime dependent" firms are those with all loans priced relative to the prime rate. All regressions also include year and one-digit-SIC dummies. Firm and bank data are from the year prior to the loan.

TABLE 6

Spread as a Function of Loan, Firm, and Bank Attributes
Secured and unsecured loans

	Nonmissing secured data			All loans		
	(a)	(b)	(c)	(d)	(e)	(f)
Intercept	201.27*	341.32*	83.68	254.89*	347.51*	160.18*
Maturity	–5.15*	1.57	–5.14*	–2.43*	3.31*	–2.30*
Log of facility size	0.88	–9.16*	0.91	–3.41*	–10.63*	–2.91†
Purpose: recapitalization	18.92*	17.60*	17.87*	21.81*	21.38*	20.88*
Purpose: acquisition	10.29	14.45	10.41	24.41*	20.67*	24.80*
Purpose: LBO	96.69*	100.56*	95.81*	114.25*	103.82*	112.28*
Purpose: miscellaneous	–18.07	–8.69	–18.88	–1.98	–6.92	–3.53
Type: revolver < 1 year	39.47*		39.67*	35.62*		36.59*
Type: revolver ≥ 1 year	–19.17*		–19.05*	–14.28*		–14.15*
Type: bridge loan	132.22*		131.88*	130.17*		128.48*
Prime rate dummy	150.74*	139.01*	152.11*	149.93*	146.24*	128.23*
Secured dummy	40.30*	38.63*	40.76*	34.20*	32.86*	32.88*
Missing secured data dummy				–13.95*	–10.14	–14.25*
Log of market capitalization	–8.25*	–6.00*	–7.96*	–10.63*	–9.98*	–8.80*
Leverage ratio	18.88	41.23*	15.63	29.70*	47.10*	25.14*
PP&E-to-asset ratio	–20.99	–33.29*	–23.30†	–23.40*	–23.67*	–24.96*
Current ratio	–7.88*	–2.22	–8.39*	–5.24*	–1.79	–6.42*
Bank equity capital ratio < 5.5%	12.69*	12.81†	12.73*	10.15*	11.19*	10.28*
Nonperforming loans, % of assets	9.09*	5.65†	9.25*	6.32*	4.66*	6.68*
Log of bank assets	–2.60	–1.50	–2.57	–0.18	0.22	–0.48
Loan loss provision, % of assets	–6.74†	–4.88	–6.79†	–7.63*	–6.67*	–7.73*
Cash and securities, % of assets	–0.11	–0.70*	–0.06	–0.25	–0.54*	–0.23
Bond rating: A– to A+			102.42			64.31*
Bond rating: BBB– to BBB+			105.86			60.47*
Bond rating: BB– through BB+			138.03*			98.43*
Bond rating: B+ or below			110.50†			93.07*
Bond rating: unrated			114.88†			86.67*
Number of observations	1480	697	1480	2763	1451	2763
Adjusted R squared	0.5708	0.5596	0.5724	0.6243	0.6341	0.6281

Notes: The * and † symbols denote statistical significance at the 5 percent and 10 percent levels, respectively. Models presented in columns (a), (b), and (c) use only those observations with nonmissing secured data. Models presented in columns (e), (f), and (g) use all observations, and include a dummy variable equal to one when the secured data is missing. All regressions also include year and one-digit-SIC dummies. Firm and bank data are from the year prior to the loan.

TABLE 7

Probit Regressions for Collateral

	(a)	(b)	(c)	(d)
Intercept	–0.77	–0.62	–0.53	–0.35
Maturity	0.15*	0.12*	0.11*	0.11*
Log of facility size	0.16*	0.15*	0.15*	0.15*
Purpose: recapitalization	0.58*	0.46*	0.42*	0.44*
Purpose: acquisition	0.05	0.11	0.15	0.17
Purpose: LBO	0.42	0.25	0.29	0.30
Purpose: miscellaneous	0.66†	0.43†	0.66*	0.66*
Type: revolver < 1 year	–0.07	0.08	0.13	0.13
Type: revolver ≥ 1 year	–0.13	–0.09	–0.09	–0.09
Type: bridge loan	0.01	0.04	–0.17	–0.19
Prime rate dummy	0.73*	0.71*	0.70*	0.70*
Log of market capitalization	–0.29*	–0.25*	–0.26*	–0.26*
Leverage ratio	0.50	0.64*	0.70*	0.68*
PP&E-to-asset ratio	–0.52	–0.77*	–0.63*	–0.61*
Current ratio	–0.12	–0.07†	–0.06	–0.06
Interest-to-sales ratio	2.58	2.35	2.02	2.03
Quick ratio	0.06			
Tobin's *Q*	–0.10			
Zero or missing R&D	–0.06			
R&D-to-asset ratio	0.40			
Three-year sales growth	0.49†			
Bank equity capital ratio < 5.5%			–0.02	–0.04
Nonperforming loans, % of assets			0.08†	0.08
Log of bank assets			–0.02	–0.02
Loan loss provision, % of assets			–0.02	–0.06
Cash and securities, % of assets			0.00	0.00
Equity capital, % of assets			0.01	
Bank ROA			0.03	
Net chargeoffs			–0.04	
Number of observations	1117	1701	1468	1472
Number secured	956	1456	1248	1252
Number unsecured	161	245	220	220
Log likelihood	–347.5	–558.8	–491.6	–492.5

Notes: Positive coefficients imply a higher probability that the loan is collateralized. The * and † symbols denote statistical significance at the 5 percent and 10 percent levels, respectively. All regressions also include year and one-digit-SIC dummies. Firm and bank data are from the year prior to the loan.

TABLE 8

Spread on Secured Loans: Within and Between Deals

	Pooled		Within		Between	
	(a)	(b)	(c)	(d)	(e)	(f)
Intercept	315.00*	153.77	—	—	–34.65	90.73
Secured	–34.52	56.36*	–79.78*	14.00	499.08*	909.21*
Maturity		–0.63		–0.59		–0.68
Log of facility size		3.50		–5.69		21.66
Purpose: recapitalization		8.79*		12.84		39.31
Purpose: acquisition		–6.37		—		4.78
Purpose: LBO		47.06		–37.84		29.87
Purpose: miscellaneous		69.07		27.56		–78.01
Type: revolver < 1 year		12.90		103.12		–32.67
Type: revolver ≥ 1 year		–9.75		–11.00		–29.76
Type: bridge loan		155.06*		143.21*		28.75
Prime rate dummy		96.96*		101.21*		135.24†
Number of observations	94	94	94	94	32	32
Adjusted R squared	0.0024	0.4373	0.1247	0.5996	0.3423	0.5561

Notes: The * and † symbols denote statistical significance at the 5 percent and 10 percent levels, respectively. Standard errors for the "within" regression are adjusted to reflect the estimation of the 32 deal-specific means. The sample consists of deals in which some facilities are secured, while others are not. The "within" regressions use data transformed by the removal of deal-specific means. The "between" regressions use the means for each deal.

TABLE 9

Within-firm Relationship Among Spread, Bank, and Firm Attributes
Secured Loans Only

		Sales		Market capitalization		Prime dependent	
	Full sample	High	Low	High	Low	No	Yes
Maturity	–5.81*	–0.70	–14.82*	–3.33	–12.42*	–3.52	–17.68*
Log of facility size	–2.84	–4.65	2.37	–0.52	1.29	–5.88	18.57
Purpose: recapitalization	20.07	–45.10*	23.73	–29.75	–0.93	–37.70*	9.63
Purpose: acquisition	–3.51	–18.83	13.57	–10.72	–23.40	–7.07	–0.27
Purpose: LBO	63.89	40.46	—	62.12	—	31.21	—
Purpose: miscellaneous	–11.29	–19.15	–33.08	–12.93	–57.65	–19.92	–55.71
Type: revolver < 1 year	34.71	49.37	–7.53	64.03†	–95.11†	49.52†	–45.17
Type: revolver ≥ 1 year	–20.92†	–12.87	–45.28†	–19.53	–35.08†	–16.70	–48.51†
Type: bridge loan	175.83*	274.02*	74.72	185.98*	—	274.99*	68.88
Prime rate dummy	117.32*	145.05*	74.37*	125.53*	117.43*	115.91*	—
Log of market capitalization	–30.95*	–23.20†	–43.77*	–24.67*	–17.98	–21.86*	–69.30
Current ratio	–5.11	–1.74	–16.26	–2.08	–29.37	–4.41	18.66
Leverage ratio	–30.81	46.94	11.85	–14.11	–114.05	23.92	78.57
PP&E-to-asset ratio	–74.90	–23.82	–113.11	–57.27	–74.90	–75.09	–126.61
Bank equity capital < 5.5%	19.89	–4.89	67.59*	15.72	68.35*	1.15	124.47*
Nonperforming loans, % of assets	6.98	6.45	–6.10	7.02	3.48	8.78†	–10.37
Number of observations	289	189	100	212	77	224	65
Number of firms	89	61	28	64	25	71	18
Adjusted R squared	0.5465	0.6403	0.4867	0.5640	0.5356	0.6080	0.4119

Notes: The * and † symbols denote statistical significance at the 5 percent and 10 percent levels, respectively. Standard errors are adjusted to reflect the estimation of firm-specific means. "Low" sales and market capitalization corresponds to the bottom third of the sample: $62.26 million for sales and $34.91 million for market capitalization. "Prime dependent" firms are those with all loans priced relative to the prime rate. The regressions also include year dummies. Firm and bank data are from the year prior to the loan.

TABLE 10

Cash-to-Asset Ratio as a Function of Firm and Lender Attributes

	Full sample		Low market capitalization	Low sales	Prime dependent	Non-switchers
Intercept	0.203*	0.201*	0.252*	0.151*	0.175*	0.195*
Market to book ratio	0.011*	0.011*	0.001	0.012*	0.011*	0.011*
Log assets	–0.004*	–0.005*	–0.015*	0.018*	0.009*	–0.002†
Cash flow to asset ratio	–0.040*	–0.040*	0.006	–0.028	–0.019	–0.061*
Financial working capital to asset ratio	–0.207*	–0.207*	–0.179*	–0.245*	–0.208*	–0.201*
Investment to asset ratio	–0.211*	–0.211*	–0.101*	–0.200*	–0.177*	–0.231*
Leverage ratio	–0.286*	–0.286*	–0.318*	–0.461*	–0.357*	–0.310*
Industry cash flow volatility	0.283*	0.285*	0.121	0.507*	0.301*	0.318*
Zero or missing R&D	–0.013*	–0.013*	–0.019†	–0.022*	–0.014	–0.015*
R&D-to-asset ratio	0.451*	0.449*	0.124	0.535*	0.394*	0.410*
Dividend dummy	–0.027*	–0.027*	0.004	–0.030*	–0.016*	–0.031*
Bond rating	0.002	0.002		0.027	0.093	–0.004
Commercial paper rating	–0.046*	–0.047*				–0.042
Bank equity capital ratio < 5.5%		0.005†	0.018*	0.012*	0.004	0.011*
Number of observations	6938	6938	1127	1393	1427	4659
Adjusted R squared	0.3534	0.3536	0.2680	0.3781	0.3108	0.3439

Notes: The * and † symbols denote statistical significance at the 5 percent and 10 percent levels, respectively. "Low" sales and market capitalization corresponds to the bottom third of the sample: $62.26 million for sales and $34.91 million for market capitalization. "Prime dependent" firms are those with all loans priced relative to the prime rate. All regressions also include year and one-digit-SIC dummies.

DATA APPENDIX

A. Matching Datasets

We begin with an extract of the LPC *Dealscan* database, containing data on 11,221 loan facilities originated by U.S. banks from 1986 through 1992. Of these, 2220 observations had missing loan rate data. An additional 256 observations lacked data basic characteristics of the loan (*e.g.*, maturity or size) leaving 8745 facilities.

Using the name of the lead lender in *Dealscan*, we matched these observations were then matched to bank-level Call Report data. Matching was not possible in many cases, either because no matching bank name could be found, or because more than one bank was found with the same name. Of the 8745 facilities with nonmissing loan data, 6490 were successfully matched with bank data.

Using the borrower name and location reported in *Dealscan*, we matched the loan data with firm data from Compustat. A total of 4666 facilities were successfully matched; 4017 of those were matched with Compustat *and* Call Report data. The Compustat dataset contains missing values in many cases, however. Of the loans matched to bank and firm data, 1098 had missing (or zero) values for sales, market capitalization, or an important category of assets or liabilities, leaving 2919 facilities with usable data.

An additional problem is that the *Dealscan* database lacks information on whether the loan is secured for roughly 60 percent of the observations. Restricting the analysis to observations with nonmissing secured data further reduces the number of observations to 1574.

B. Outliers

We examined the data was examined for extreme values, and we dropped a modest number of observations as outliers; Table A1 summarizes the criteria used for outlier classification. Values of any given variable in excess of the cutoff, were replaced with the missing value code. The number of observations lost therefore depends on whether the variable was included in the regression. In the specification in column (d) of Table 2, for example, these criteria resulted in the loss of 89 observations.

C. Deflators

Nominal variables not expressed as a ratio were deflated using the annual average of the GDP deflator for the relevant year.

D. Categorization of Loan Purpose and Type

LPC reports 16 distinct loan purposes, which we group into six categories according to Table A2, and assigned dummy variables. The "general" dummy not included in the regression, and the spread corresponding to this purpose is subsumed into the intercept. Loans falling into the "other" category are omitted from the analysis.

LPC also reports 11 different loan types. Loan commitments, term loans, notes, and demand loans are not distinguished, and the average spread on these types is subsumed into the intercept. We include dummy variables are included for revolvers with maturity less than one year, revolvers with maturity greater than one year (including 364-day facilities), and bridge loans. None of the other three loan types, multi-option facilities, standby letters of credit, or acceptances — appears in our sample.

TABLE A1

Outlier Definitions

Variable	Cutoff	Number of observations lost
All-in spread	> 1000 basis points	9
Current ratio	> 8.408	31
Quick ratio	> 5.68	29
Tobin's *Q*	> 3.839	32
Three-year average sales growth rate	< 25.9% or > 148.1%	79
Bank capital-asset ratio, %	< 2% or > 15%	33
Nonperforming loans, %	> 10%	20
Net chargeoffs, %	> 5%	15
Bank ROA, %	> 20%	3

TABLE A2

Loan Purposes and Spreads

Category	Purpose	Number	Percent unsecured	All-in spread	
				Unsecured	Secured
General	General corporate purposes	1,306	22	150	273
	Working capital	1,168	15	161	278
Recapitalization	Recapitalization	177	6	274	276
	Debt repayment/consolidation	1,062	8	244	280
Acquisition	General acquisitions	153	15	203	274
	Takeover acquisitions	512	9	181	313
LBO	Leveraged buyout	419	7	453	362
Miscellaneous	Project finance	45	13	159	214
	Real estate	90	16	174	293
	Securities purchase	64	9	163	277
	Stock buyback	39	21	57	211
	Trade finance	20	15	158	265
Other	Debtor-in-possession	46	0	—	609
	CP backup	33	49	73	88
	Credit enhancement	3	33	—	398
	ESOP	42	5	—	143