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Bank Loan Supply, Lender Choice, and Corporate Capital Structure

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ABSTRACT

This paper explores the relevance of capital market supply frictions for corporate capital structure decisions. To identify this relationship, I study the effect on firms' financial structures of two changes in bank funding constraints: the 1961 emergence of the market for certificates of deposit, and the 1966 Credit Crunch. Following an expansion (contraction) in the availability of bank loans, leverage ratios of bank-dependent firms significantly increase (decrease) relative to firms with bond market access. Concurrent changes in the composition of financing sources lend further support to the role of credit supply and debt market segmentation in capital structure choice.

ARE CAPITAL MARKET SUPPLY FRICTIONS relevant for corporate capital structure decisions? If the supply of different forms of capital is infinitely elastic, as assumed by Modigliani and Miller (1958), then debt levels are determined solely by a firm's demand for debt. However, several recent pieces of evidence suggest this may not be the case. First, anecdotal (Titman (2002)) and survey (Graham and Harvey (2001)) evidence suggest that practitioners view supply conditions as important inputs to the capital structure decision. Second, Faulkender and Petersen (2006) present evidence that firms with a bond rating have higher leverage ratios than those without, even after controlling for debt demand. These authors interpret this finding as suggesting that debt market segmentation may put constraints on some firms' ability to borrow. As a result, observed leverage ratios may not reflect those demanded.

Identification of a supply effect with cross-sectional evidence is complicated by concerns over direction of causality and potential endogeneity. As Faulkender and Petersen (2006, p. 75) note, however, their "findings raise the possibility that shocks to certain parts of the capital markets affect firms' [finances] differentially." In particular, if some firms cannot easily move from private to

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public debt markets, shocks to the banking system may have the largest impact, an issue they leave to future research. Put differently, the link between debt market segmentation and capital structure may be more sharply identified by studying the differential impact of a shift in loan supply on the capital structures of firms with varying degrees of bond market access.

In this paper, I exploit a loosening and a tightening in bank funding constraints to identify the effect of supply frictions on both leverage ratios and the choice of capital provider. The loosening event of interest is the emergence of the market for negotiable certificates of deposit (CDs) in 1961. This financial innovation allowed banks to reverse the outflow of deposits caused by a shift in corporate cash holdings from noninterest bearing bank deposits to other money market instruments. The tightening event is the 1966 Credit Crunch, in which government pressure for credit restraint and the imposition of Regulation Q interest rate ceilings limited banks' ability to access time deposits and extend new loans. As I discuss below, these events provide a particularly well-suited quasi-experiment for identifying the effect of supply frictions on capital structure. First, there is strong evidence that they represent changes in credit supply. Second, the supply shocks are bank-specific rather than shocks to total capital supply. Third, their effects on the cross-section of financial structures were unlikely to be driven by any concurrent changes in credit demand.

The expected response to these loan supply shocks depends on a firm's access to different segments of the capital markets. For example, when faced with a contraction in loan supply, firms without access to public debt markets will need to find alternate sources of capital to avoid capital constraints.[1] These may include internal funds, external equity, trade credit, or nonbank private debt. With the exception of the last possibility, all of these substitutions would result in relatively lower (higher) leverage following a loan supply contraction (expansion). Larger firms, on the other hand, will likely be less affected for two reasons. First, banks' lending to small, risky firms may be more sensitive to credit supply than their lending to larger firms (e.g., Holmstrom and Tirole (1997)). Second, larger firms can more easily substitute toward nonbank public debt sources in response to changes in the cost or availability of bank debt. By treating firms with debt market access as a control group, I can exploit this differential sensitivity to the supply shocks in order to identify the effect of supply frictions on capital structure.

I begin by showing that, consistent with these predictions, the leverage of small, bank-dependent firms rises (falls) relative to that of large, less bank-dependent firms following positive (negative) loan supply shocks. If these leverage changes are caused by changes in bank loan availability, they should be accompanied by relative shifts in the composition of debt finance. Consistent with this prediction, I show that the ratio of long-term bank debt to total long-term debt increases (decreases) for small, bank-dependent firms, relative

[1] Gertler and Gilchrist (1994), Kashyap, Lamont, and Stein (1994), and Hancock and Wilcox (1998) show evidence that loan supply shocks lead to capital constraints for small private firms. As Faulkender and Petersen (2006) discuss, however, such constraints are likely to be less severe for publicly traded firms.

to firms with public market access, following positive (negative) loan supply shocks. Additionally, the use of equity capital by small firms, relative to large firms, is negatively correlated with loan supply shifts. Finally, the use of public debt by firms with access to public markets increases, relative to that of small firms, following the 1966 Credit Crunch.

These results suggest that bank loan supply movements are also an important determinant of variation in firms' debt placement structures. They also help clarify the mechanisms behind the relative leverage changes. First, the mix of debt sources appears more sensitive to loan supply shifts for small firms than for large firms. This suggests that in response to these supply shocks, loan markets do not clear simply through a single price mechanism. Rather, lending terms appear to change differentially across borrower types. Second, the shift by large firms into public debt in response to tight loan supply can explain the persistence of the leverage effect, given the significant adjustment costs associated with public capital markets.

I also show evidence that the effects of credit supply shocks on capital structure are not limited to the particular events I study. Using an extension of the empirical model in Faulkender and Petersen (2006) and several proxies for the tightness of credit conditions, I show that the cross-sectional difference in leverage between firms with and without bond market access is negatively correlated with loan supply over a 30-year sample period.

This study's findings have several implications for the capital structure literature. First, the informational asymmetries and fixed transaction costs that create segmentation in debt markets are shown to be relevant for capital structure choice. Second, these results suggest that differential responses to credit supply shocks may account for some of the previously unexplained heterogeneity in capital structures (e.g., Welch (2004), Lemmon, Roberts, and Zender (2008)). As discussed by Titman (2002) and Brealey and Myers (1996), one way that firms can use financing choices to enhance firm value in imperfect markets is by altering the security issued in response to a supply-demand imbalance in the capital market. In the case of segmented lending markets, frictions limiting banks' available loan supply can create such imbalances. Finally, while many previous studies have documented a positive relationship between firm size and leverage, uncertainty remains as to the economic interpretation of this relationship.[2] For example, while many authors have interpreted firm size as a proxy for expected bankruptcy costs, cross-country evidence documented by Rajan and Zingales (1995) does not support this interpretation. To the extent that smaller firms are subject to relatively larger transaction costs and informational frictions, however, my results suggest size may be an important capital structure determinant because it proxies for debt market access.

The remainder of the paper is organized as follows. Section I provides some background on the historical events I study and presents the empirical hypotheses. Section II discusses the experimental design and identification strategy. Section III describes the data sources. Results for the impact of these events on

[2] See, for example, Rajan and Zingales (1995) and Kurshev and Strebulaev (2006).

leverage ratios, debt placement structure, and financing choice are presented in Section IV. Section V extends the leverage analysis to a longer time period and alternative credit condition proxies. Section VI discusses further implications of these findings and concludes.

I. Credit Market Background and Hypotheses

A. *1961: The Emergence of the Bank CD*

As discussed by Mishkin (2003), before the 1960s banks viewed their liabilities as essentially fixed by investor demand for deposits. Yet, throughout the 1950s, as corporations became more adept at cash management, they increasingly moved idle cash from noninterest bearing bank deposits to other money market instruments. According to Morris and Walter (1993, p. 37), "Demand deposits and currency as a percentage of total financial assets of nonfinancial corporate businesses declined from 29% in 1946 to 16% in 1960."

The result for banks was the loss of an important source of loanable funds. As reported by the *New York Times* in early 1961 (Kraus (1961a, p. 58)),

> [C]orporations have pared their demand deposits and increased their investments in Treasury bills, acceptances and commercial and finance paper. New York banks doing business chiefly with large corporations . . . have sustained deposit declines.

Indeed, GNP growth in the 1950s (80%) far outstripped that of demand deposits (21%) (Nadler (1964)). From 1950 to 1960, checking account deposits and time and savings accounts at commercial banks increased by $25 billion and $35 billion, respectively. By comparison, time and savings accounts outside of commercial banks rose by $106 billion (Kraus (1961b)).

At the time, banks had limited ability to stop this deposit outflow. Federal regulation prevented the payment of interest on demand deposits. While they were permitted to pay interest on time deposits, this was capped by the Federal Reserve at 3%, below rates offered by savings and loans and, importantly, these deposits lacked the liquidity offered by Treasury bills and commercial paper. As described in the *Wall Street Journal* on January 4, 1961, "Commercial banks . . . have made repeated attempts in recent years to get the Federal Reserve Board to boost the permitted ceiling on savings interest payments." (p. 9) This suggests that the loss of corporate deposits was creating a binding funding constraint, an idea echoed in the 1959 annual report of First National City Bank of New York (later Citibank):[3]

> The extent to which banks can liquidate investments for the purpose of adding to loanable funds is limited . . . Except as deposits increase, [regulatory] requirements impose an approximate ceiling on lending capacity.

As Wojnilower (1980) discusses, prior to the emergence of bank CDs, bank-dependent firms were often constrained in their access to capital because "their

[3] See Cleveland and Huertas (1985, p. 243).

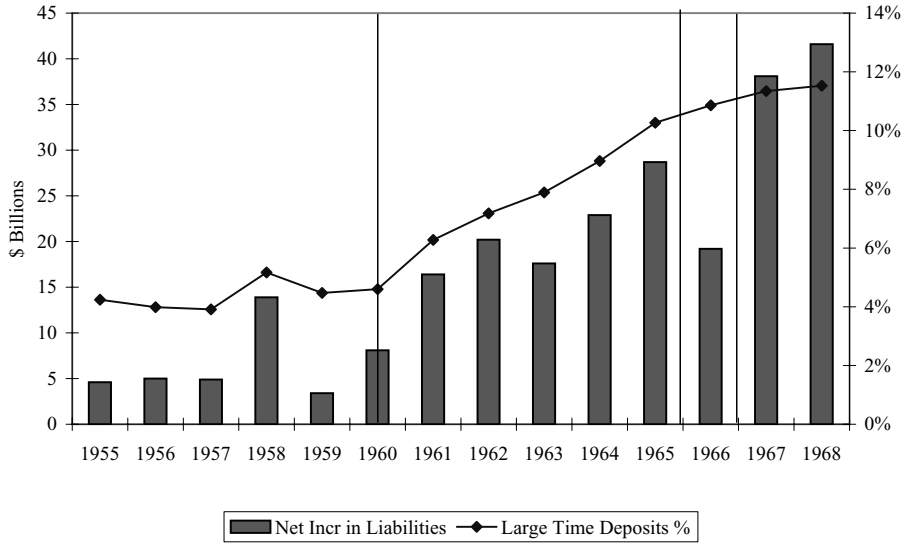


Figure 1. Commercial bank funding. Data are from the Flow of Funds Accounts of the United States. The bars (left-hand axis) represent the annual net change in total liabilities at U.S. commercial banks. The line (right-hand axis) represents large time deposits as a percentage of total outstanding deposits (checkable, small time, and large time deposits).

'lead' banks remained essentially dependent on narrow local deposit markets" (p. 284).

In an effort to ease this constraint, the first large denomination negotiable certificate of deposit was issued by First National in February of 1961. The negotiability of this instrument, combined with the agreement of a government securities dealer, The Discount Corporation of New York, to make a secondary market for such instruments led to a surge in their use shortly after (Roussakis (1997)). Large denomination CDs at the Federal Reserve System's weekly reporting banks rose from less than $1 billion in 1961 to $26.1 billion in 1970, where this latter amount represented 32% of the outstanding commercial and industrial loans (Friedman (1975)).

This new financing instrument allowed banks to bid for capital from a much broader base of investors and therefore enabled them to expand their loan portfolios. The impact of the CD on bank funding can be seen in Figure 1, which shows the annual net increase in liabilities at U.S. commercial banks along with the percent of deposits accounted for by large time deposits, based on data from the U.S. Flow of Funds Accounts. As can be seen, the emergence of this new market led to a rapid increase in commercial bank growth that corresponds precisely to a rapid increase in the use of large time deposits (i.e., CDs) as a source of bank funds. As described by Cleveland and Huertas (1985, p. 256) in their history of Citibank:

> The CD . . . would solve the funding problem, thereby opening the way to faster growth. Instead of matching loan commitments to the supply of

bonds that could be sold, banks would now be able to book loans they thought profitable, knowing the funds would be available in the market at a price.

At the same time, effective January 1, 1962, the Federal Reserve increased the Regulation Q interest rate ceilings on savings and short-term time deposits by 50 basis points and on time deposits with maturity at least 1 year by 100 basis points (Reierson 1962), further increasing banks' ability to compete for deposits. As a result, the growth rate in time deposits at commercial banks rose from 7.0% over the 1950s to 15.4% from 1961 to 1965 (Friedman (1975)).

B. The 1966 Credit Crunch

I now turn from an event representing an expansion of the supply of bank loans to an event representing a contraction. According to Kashyap, Stein, and Wilcox (1993), the Credit Crunch of 1966 represented "one of the most significant periods of tight credit in the post-WWII period." (p. 85) The term "Credit Crunch" is often used to refer to the relatively brief period in the third quarter of 1966 in which Regulation Q interest rate ceilings became binding for the first time, causing a sharp withdrawal of funds from banks and a subsequent liquidity crisis in the municipal bond markets as banks sought to rebalance their portfolios. However, this period can be seen as the pinnacle of a longer period lasting for at least half that year in which governmental pressure constrained bank loan supply. (See Owens and Schreft (1995) and Burger (1969) for helpful reviews of this episode.)

Owens and Schreft (1995) argue that such government "jawboning" was a more important factor than interest rate ceilings in slowing loan growth during this period. They appeal to quotes from various government and bank industry documents in making this case. For example, in February 1966, President Johnson "stated that he was counting on the Fed to prevent excessive credit flows from generating inflation." That same month, Fed Board Governor Sherman Maisel said that "banks may have to fight inflation by refusing credit to customers who in other circumstances would be welcomed." At the March 1, 1966 Federal Open Market Committee (FOMC) meeting, members agreed to meet with bankers in their districts to discuss the necessity for credit restraint through nonprice rationing. A mid-1966 American Bankers Association publication stated that "The period ahead is not going to be an easy one for banks . . . we are going to have to restrain the expansion of credit . . . The Administration has urged bankers to use credit rationing as a device to supplement interest rate increases as a means of limiting credit expansion." The report also recommended that banks reduce loan supply by deferring loan requests and encouraging borrowers to find other sources of funds.

In July 1966, the Fed allowed, for the first time, Regulation Q interest rate ceilings on CDs to become binding, resulting in an outflow of funds from banks (disintermediation). Banks tried to respond by selling off government and municipal securities, creating a liquidity crisis in these bond markets. The impact

on bank funding can again be seen in Figure 1. Commercial bank growth slowed sharply in 1966 just as growth in the fraction of deposits attributable to CDs tapered off. Thus, the new deposit source that allowed banks to meet the rising credit demand of the mid-1960s was suddenly shut off. In August of that year, large commercial banks' holdings of business loans fell by $668 million, despite continued robust economic growth (year-on-year GDP growth of 6.0% for the quarter). In September 1966, the Federal Reserve Board sent a letter to member banks urging banks to slow the growth of their business loan portfolios and threatening to limit discount window access for banks that did not.

By October 1966, bank credit growth had slowed and credit conditions were more relaxed. Therefore, I initially define an event window of 1966:Q2–Q3, consistent with the definition in Owens and Schreft (1995). As I discuss later, however, the impact of the event on financing decisions seemed to persist after the official crunch had ended, as those firms that were able to reduced their exposure to similar future episodes.

Several aspects of this episode make it particularly suitable for studying the impact of a reduction in the supply of bank loans. First, unlike later monetary tightenings accomplished via open market operations, the use of Regulation Q ceiling rates, as well as the pressure exerted by the Fed on bankers to limit the expansion of credit, made this tightening clearly associated with frictions that limit the ability of banks to access capital and extend credit. In addition, this episode is unique even relative to later instances of binding interest rate ceilings. For one, the euro market provided an alternate source of funds for banks when Regulation Q ceilings became binding again in the 1970s. In 1966, however, this market was still in its infancy, so banks were less able to circumvent the interest rate ceilings. Second, this episode likely came more as a surprise to banks and firms than later episodes, since previously each time the interest rate ceilings became close to binding, the Fed stepped in to raise the ceiling (Burger (1969)). This was the first time the Fed chose to allow the ceiling to bind as a monetary policy tool.

II. Experimental Design

A. Empirical Hypotheses

In order for changes in the amount of credit flowing through the banking system to influence corporate leverage ratios, two conditions must hold. First, loans must not be perfect substitutes for other assets held by banks, so that, for example, an outflow of deposits leads to a reduction in loan supply, not simply a rebalancing of bank portfolios. This assumption is reasonable, given the regulatory scrutiny of the risk of banks' asset portfolios, and is consistent with theoretical models such as Bernanke and Blinder (1988) and the empirical evidence in Kashyap et al. (1993).

Second, some firms must not be able to freely and costlessly substitute among debt sources. This is in keeping with the view of banks as lenders with unique capabilities in information collection, monitoring, and renegotiation,

that therefore specialize in providing capital to informationally opaque firms.[4] Thus, relatively transparent firms access public capital markets while those that face greater information problems are limited to private debt and equity markets.

Given this debt market segmentation, a change in banks' funding constraints will alter the relative cost and/or availability of bank debt for informationally opaque firms, leading to substitution toward nonbank private lenders and nondebt sources of financing. This will affect both leverage ratios and the proportion of loans held by banks for these firms, relative to what they would experience in the absence of the supply shock. While this counterfactual is unobservable, the effect of supply frictions can be identified by comparing the capital structure responses of these firms to an unaffected control group. The leverage ratios of larger, more transparent firms will likely be largely unaffected by changes in banks' funding constraints due to the response of banks on the one hand and the response of firms on the other.[5]

First, when facing a change in loanable funds supply, banks may discriminately change the availability or cost of loans. Such an outcome could result from quantity rationing as described by Stiglitz and Weiss (1981) and Jaffee and Russell (1976). In this case, a decrease in loan supply is likely to increase the degree of rationing for the marginal risk class of firms, while lending to the safer classes would be unaffected. Additionally, changes in the nonprice credit terms such as capital requirements are likely to be more onerous for smaller firms (Holmstrom and Tirole (1997)). Regulatory supervision concerns may also play a role: If a banker has less money to lend, she is likely to first cut the riskiest loans when the bank is concerned about meeting standards for the riskiness of its loan portfolio. If this differential change in loan availability and terms holds, then following a loan supply expansion (contraction), we expect both the leverage ratios and the proportion of loans held by banks to increase (decrease) for small firms, relative to firms with bond market access.

Second, even if all firms face the same change in lending terms, larger firms will be less affected due to their greater ability to substitute toward arm's length debt financing. If anything, their (public) borrowing may increase in order to finance increased extension of trade credit to smaller firms (Calomiris, Himmelberg, and Wachtel (1995)) or due to the greater transaction costs associated with floating public debt (Stafford (2001)). This would again lead to a relative leverage increase (decline) for small firms following a relaxing (tightening) of banks' funding constraints. However, given their greater ability to substitute, we would now expect the debt placement structures of firms with public market access to be more sensitive to changes in the supply of loanable funds at banks.

These predictions are summarized in the table below, which shows the predicted effects following a loan supply contraction. The opposite directions are predicted following an expansion.

[4] See Diamond (1984, 1991), Fama (1985), James (1987), and Rajan (1992).

[5] There is potentially a third reason, namely, that not all banks are affected by the changes in funding constraints and different banks lend to different types of firms. However, as I discuss in Section III, this is unlikely to be an issue for the sample of firms studied here.

Hypothesis		Differential change in lending terms(a)	Differential patterns of substitution(b)
1	Leverage	–	–
2	ΔEquity/ΔDebt	+	+
3	Bank/non-Bank	–	+
4	Public/Private	0	–

Note that the two channels described above are not mutually exclusive. It may be the case that, while small firms bear the brunt of any bank funding constraint, if the supply shock is severe enough, large firms will also be affected and seek out nonbank debt sources. The leverage and debt-equity choice results can determine if at least one of these channels is operative, while the debt mix results can provide evidence specific to each.

These hypotheses are evaluated using a difference in differences specification (see, for example, Meyer (1995)). For example, to evaluate Hypothesis 1, I estimate

$$Leverage_{it}^{j} = \alpha + \alpha_1 d_t + \alpha_2 d^j + \alpha_3 d_t d^j + X_{it}^{j'}\beta + Z_t'\gamma + \epsilon_{it}^{j}, \tag{1}$$

where d_t is an indicator variable equal to one in the post-event period, d^j is an indicator variable equal to one for the experimental group (here, small firms), and X_{it}^j and Z_t are vectors of firm-specific and time period–specific control variables. In this specification, changes over time that are common to both groups and time-invariant differences in overall means are captured by α_1 and α_2, respectively. The coefficient of interest is α_3, which measures the change in leverage due to the supply shock for the small firms, relative to the large firms.

In order for this research design to identify the effect of supply frictions on capital structure, several conditions must hold. First, the events studied should represent clear changes in credit supply. Second, the supply shocks should be more pronounced in the bank loan market than in the equity and bond markets. Third, there should not be any force *other* than the supply shock causing differential changes in capital structure from the pre- to post-event periods. In other words, α_3 in equation (1) should be zero in the absence of treatment. In the remainder of this section, I present evidence that the quasi-experiment examined in this paper meets each of these criteria.

B. Was Loan Supply Affected?

Two types of evidence support the view that these events had the proposed impact on loan supply. First, all accounts of the *motivation* for both the development of the CD market and the regulatory actions surrounding the Credit Crunch by the participants themselves, the business press, and academic commentators suggest that these events were supply-driven events. Second, the empirical evidence on the aggregate mix of outstanding loans suggests the events were associated with supply shifts.

B.1. Source of Variation

As discussed in Section I.A, the funding constraints that necessitated the negotiable CD came not as a result of rising loan demand, but of a persistent drain in corporate deposits. For example, on February 21, 1961 the *New York Times* reported that "Alan H. Temple, vice chairman [of First National] said the move [to issue CDs] was being made to permit the bank to compete for deposits lost in recent years to Treasury bills and other open market securities" (Kraus (1961a, p. 49)). The same sentiment is echoed by Heebner (1969, p. 7): "Why did major banks . . . begin to issue negotiable certificates of deposit in large denominations? According to the banks, the principal reason was to attract funds which large corporations were investing to an increasing extent in Treasury bills, commercial paper, and other money market instruments."

By contrast, the motivation for the Fed's actions in 1966 was a desire to *limit* the supply of loanable funds. For example, in May of 1966, William Treiber, first vice president of the Federal Reserve Bank of New York said, "You may expect that in the present economic setting, the Federal Reserve will not supply sufficient reserves to enable banks to make all the loans requested of them by borrowers of good credit risk" (Heinemann (1966a, p. 65)). Likewise, the Federal Reserve Bank of New York, in its *Monthly Review* in July 1966 wrote: "With these certificates of deposit rates now at the Regulation Q ceiling, many banks may find it increasingly difficult to attract the funds they need to maintain their past rates of lending" (p. 162). In describing the Fed's decision to keep interest rate ceilings binding, in August of 1966 the *New York Times* reported that "the intention is to force a reduction in bank time deposits and hopefully in bank lending as well" (Heinemann (1966b, p. 9)).

Additionally, to the extent that firms changed financing behavior in response, market observers attributed this to changing supply conditions. For example, in 1970 the *Investment Dealers' Digest* reported that "The availability factor was obviously the major reason why so many companies went ahead with [public] debt financing during 1967" (p. 20). (See Section IV.B.3 below.)

B.2. Empirical Evidence

As discussed by Kashyap et al. (1993), while macro demand shocks are likely to affect total credit outstanding, a change in the *composition* of debt financing between bank and nonbank sources is a more reliable instrument to identify supply changes. Following this reasoning, Panel A of Figure 2 shows evidence of the expected changes in supply. The figure plots bank loans as a percentage of the sum of bank loans, commercial paper, and corporate bonds for the period surrounding the events studied, using quarterly Flow of Funds Accounts data. As can be seen, the bank mix increases following the introduction of the CD market and abruptly reverses at the 1966 Credit Crunch. While the increase following the CD market is gradual, it represents a reversal in trend and is consistent with the steady growth of the market seen in Figure 1.

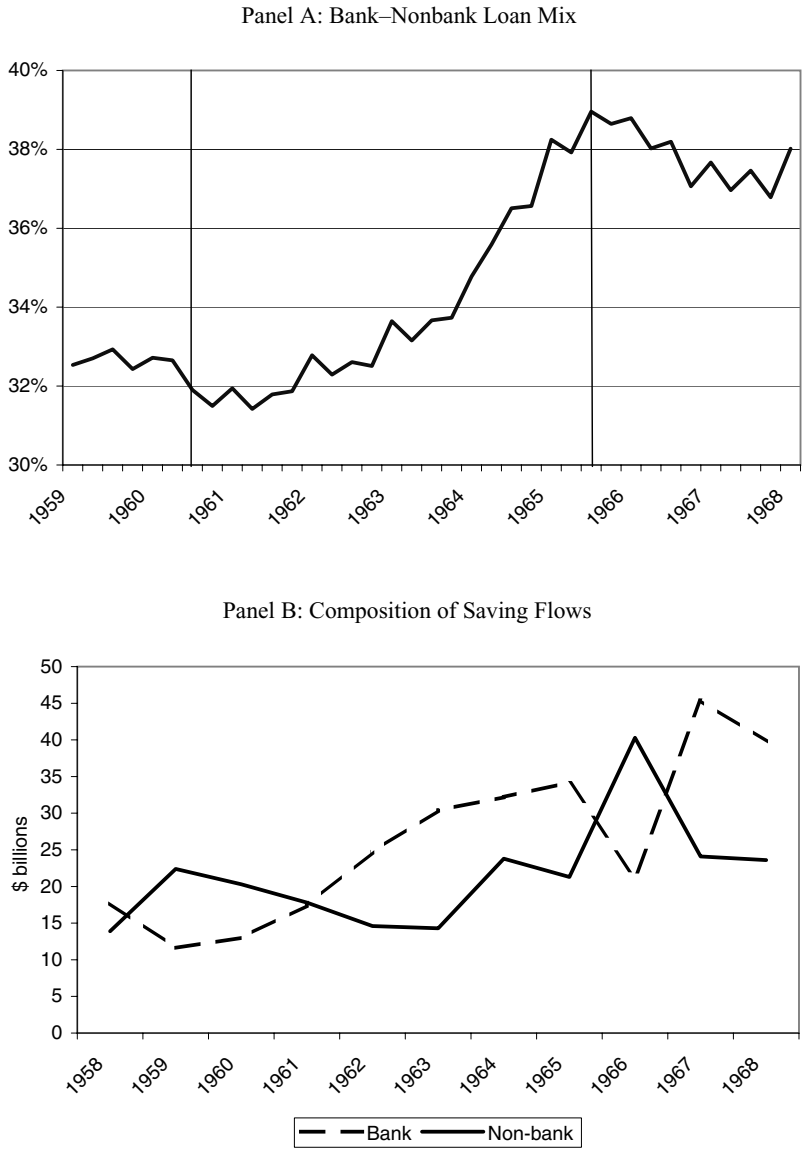


Figure 2. Aggregate borrowing and saving mix. Data are from the Flow of Funds Accounts of the United States. Panel A presents bank loans outstanding as a percent of the sum of bank loans, commercial paper, and corporate bonds. The vertical lines represent the introduction of the negotiable CD and the 1966 Credit Crunch. Panel B presents total savings flows to bank (checkable, time, and savings deposits) and nonbank (all other) vehicles.

C. Bank vs. Market Capital Supply

In order to interpret relative financial structure changes as evidence of the role of frictions associated with debt market segmentation, the shocks studied

should be specific to the banking sector. That is, they should not be concurrent with changes in the supply of other forms of capital of similar magnitude and direction. Several pieces of evidence already discussed suggest this criterion is met. First, the precipitating events specifically targeted banks' access to deposits. Second, the shifts in the mix of outstanding debt between bank and nonbank sources associated with these events, seen in Panel A of Figure 2, suggest the impact to bank loan supply was more pronounced than any impact to nonbank credit supply.

More direct evidence comes from examining the flows of personal savings. Using Flow of Funds data, Panel B of Figure 2 shows the composition of saving flows between banks (checkable, time, and savings deposits) and nonbank vehicles (largely life insurance and pension fund reserves).[6] As can be seen, in the period surrounding the introduction of the CD, total saving flows were quite stable. However, the composition of these flows between bank and nonbank vehicles moved in opposite directions. Similarly, as flows to banks fell sharply in 1966, these were replaced by a large increase in nonbank flows. Thus, in both cases, the changes in supply seemed not to be shocks to overall capital supply, but rather reallocation of supply across different segments of the capital markets.

D. Supply vs. Demand Effects

As discussed by Meyer (1995), in order for the identifying assumption in equation (1) to hold, that is, for α_3 to be zero in the absence of a supply shock, we must ensure that (i) the groups do not exhibit different trends in the outcome variable prior to the event and (ii) there are no demand-based interactions in the same direction as the hypothesized supply effects.

Evidence in support of the first condition is seen in Figure 3, which shows the change in average total leverage relative to the start of each loan supply movement for the small and large firm groups over a 6-year event window centered on each supply shock (data and sample are described in the next section). The figure shows that leverage ratios were trending closely in parallel for the two groups in the 3 years preceding each of the supply shocks. A similar result is seen in Figure 4 for trends in the use of bank and nonbank debt sources leading up to each event. The one exception is for the use of nonbank loans prior to the CD market emergence. As a result, before estimating equation (1) in this instance, I remove the pre-event trend from both series.

We also need to be concerned about post-event changes in relative capital structures that are driven by factors other than the supply shock. Adherence to this condition is assured first through controls inherent in the empirical strategy and second by evaluating credit demand conditions in the period surrounding the events.

[6] See Flow of Funds table F.10 Derivation of Measures of Personal Saving.

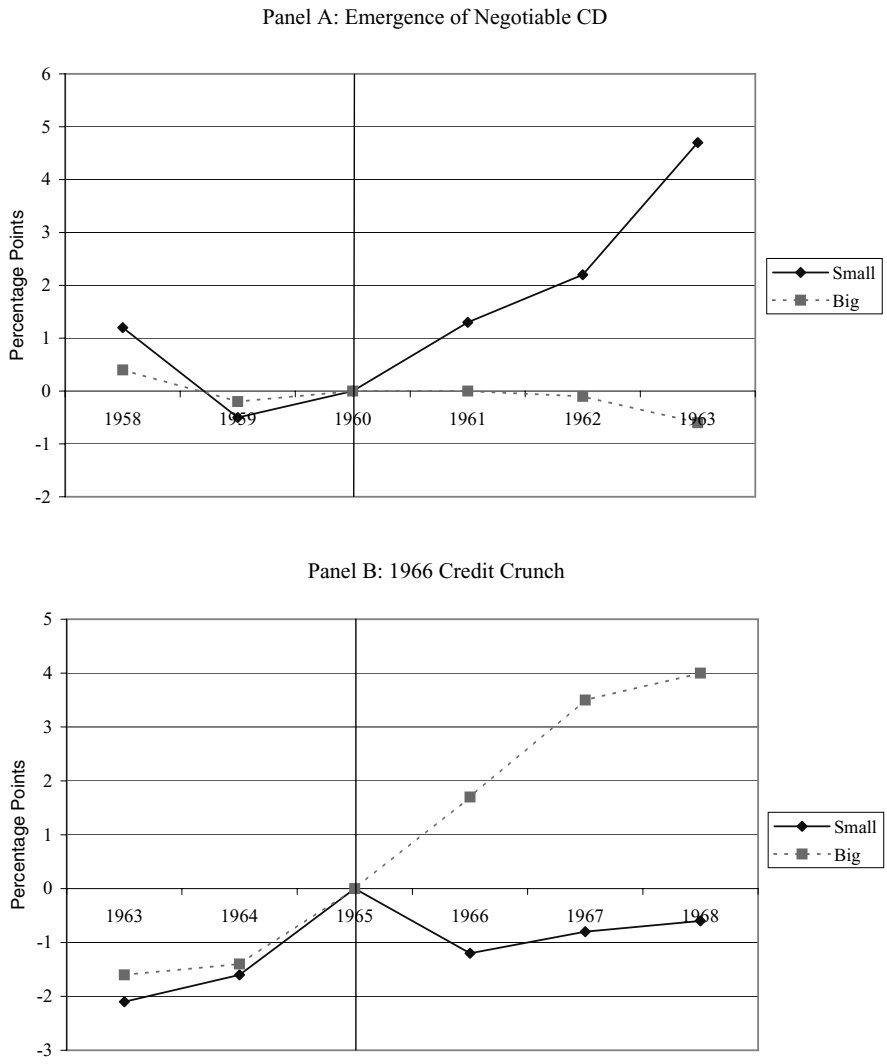


Figure 3. Relative leverage changes surrounding bank loan supply shifts. Data are from the annual Compustat database. The sample includes all manufacturing firms (SIC codes between 2000 and 3999), excluding firms involved in major mergers or acquisitions. Each panel shows, in event time, the average difference in total leverage from the start of each loan supply movement (year-end 1960 for the emergence of the CD market and year-end 1965 for the 1966 Credit Crunch). Total leverage is defined as the sum of short-term and long-term debt divided by the book value of assets. Small (big) firms are shown in the solid (dashed) lines. Small (big) firms are defined as firms in the two lowest (highest) book asset deciles at the year-end prior to the loan supply shock.

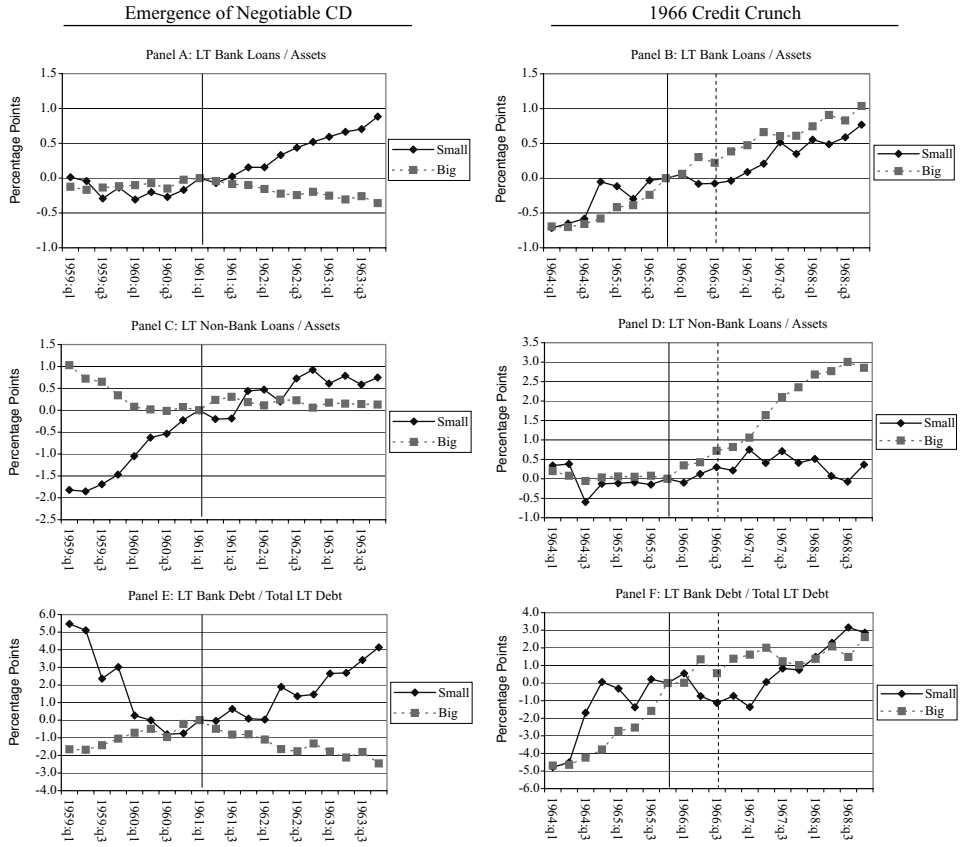


Figure 4. Bank and nonbank debt. Data are from the Quarterly Financial Report for Manufacturing. Small firms include those with book value of assets between $1 million and $10 million; large firms include those with book value of assets greater than $100 million. All series are shown as absolute changes in the relevant ratio relative to 1961Q1 (Panels A, C, and E) or 1965Q4 (Panels B, D, and F).

D.1. Empirical Specification

Several aspects of the empirical specification help to minimize concerns about endogenous demand effects. First, in the spirit of Kashyap et al. (1993), I focus on ratios of debt to equity, bank debt to nonbank debt, or public to private debt in a firm's capital structure. While a firm's demand for external finance is likely to largely reflect changes in aggregate economic growth, it is less clear that the mix of capital sources would be similarly affected.

Second, the difference in differences specification naturally nets out any changes in demand common to both groups. Additionally, I control for demand factors by including in X_{it}^{j} firm characteristics designed to proxy for firms' demand for different capital structures. Similarly, I include several proxies for macroeconomic conditions in Z_t to control for any remaining effects they may have on capital structure demand (Korajczyk and Levy (2003)). I also allow the

coefficients on both the firm-specific and macroeconomic variables to vary by group, capturing any differing responses to changing demand conditions across the firm groups.

Third, I not only compare responses across groups of firms, but also compare these relative responses across two opposite-direction supply movements. For example, if leverage ratios in one of the groups tended to increase or decrease over time relative to the other, this could explain the results from one event but not from both. Further, the two events I focus on occur in similar periods of aggregate demand. That is, they occur within the same decade and, for both events, economic growth is robust in the pre-event period, followed by a brief slowdown at the time of the event and a recovery in the post-event period.

D.2. Evidence on Credit Demand

Despite the efforts to control for demand effects described above, some concern may remain that unmodeled endogenous demand effects may push capital structures in the same direction as the predicted relative supply effects. For example, did banks market CDs simply because they foresaw growing demand for loans by smaller firms? And did relative leverage changes following the Credit Crunch simply reflect reduced credit demand by smaller firms due to a slowing economy in the wake of monetary tightening? In this section, I discuss several pieces of evidence that suggest this is not likely to be the case.

With regard to the development of the CD market, there is little evidence of increased loan demand in the early 1960s as cash flows and trade credit were growing faster than capital needs. Indeed, Nadler and Taggart (1963a, p. 13) state:

> Receivables of corporations rose from $106.9 billion at the end of 1958 to . . . $145.4 billion in the third quarter of 1962. The implication of this is that small and medium sized business concerns have become less dependent on the commercial banks for financing their inventories . . . The larger corporations, in turn, are relying more on their cash flow and on the money and capital markets to satisfy their capital requirements.

This is echoed by Nadler (1964, p. 4):

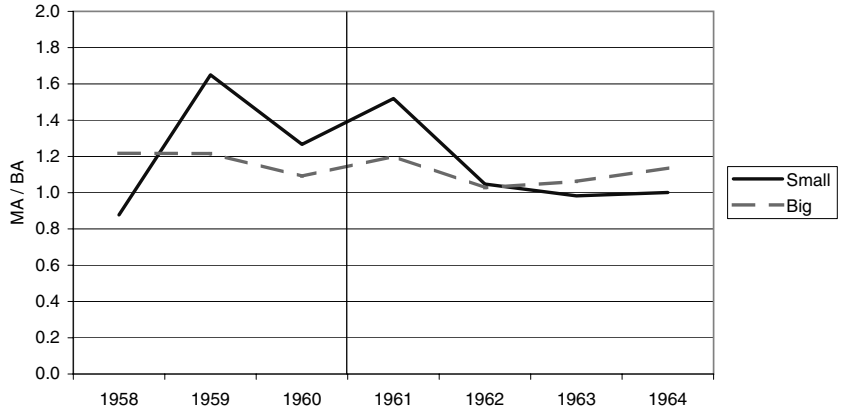
> [B]usiness demands for bank loans have been reduced by better inventory control, increased internal generation of funds, opportunities to borrow more cheaply in the open market, and more generous credit terms offered by many of the larger suppliers of goods.

and by Nadler and Taggart (1963b, p. 7):

> In the years 1961 and 1962 the internally generated resources exceeded their total expenditures for new plant and equipment.

The expanded use of trade credit suggests that if there were any cross-sectional changes in credit demand it would be in the direction of larger firms borrowing more and smaller firms less, leading to the opposite relative changes in capital structure as predicted by Hypothesis 1. Further, a look at my sample

Panel A: Emergence of Negotiable CD



Panel B: 1966 Credit Crunch

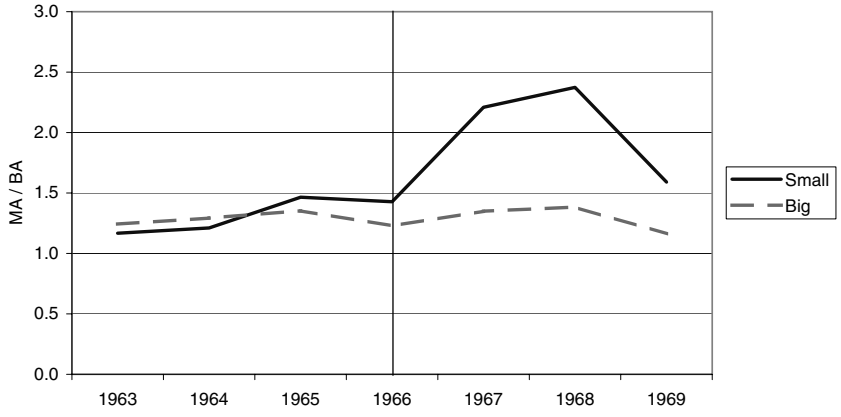


Figure 5. Growth Opportunities for Small and Large Firms. Data are from the annual Compustat database. The sample includes all manufacturing firms (SIC codes between 2000 and 3999), excluding firms involved in major mergers or acquisitions. The figures show, for each firm group, the annual median market-to-book ratio, defined as the ratio of the market value to the book value of assets, where market value of assets is defined as book assets minus book equity plus the market value of equity. Small (big) firms are shown in the solid (dashed) lines. Small (big) firms are defined as firms in the two lowest (highest) book asset deciles at the year-end prior to the loan supply shock.

firms (sample described below) shows no evidence that growth opportunities increased more for small firms than large firms around the introduction of the CD. Panel A of Figure 5 plots the annual average market-to-book ratio, a proxy for growth opportunities, for the large and small firm groups. If anything, the figure suggests growth opportunities of small firms *declined* relative to those of large firms from the pre-event to the post-event period.

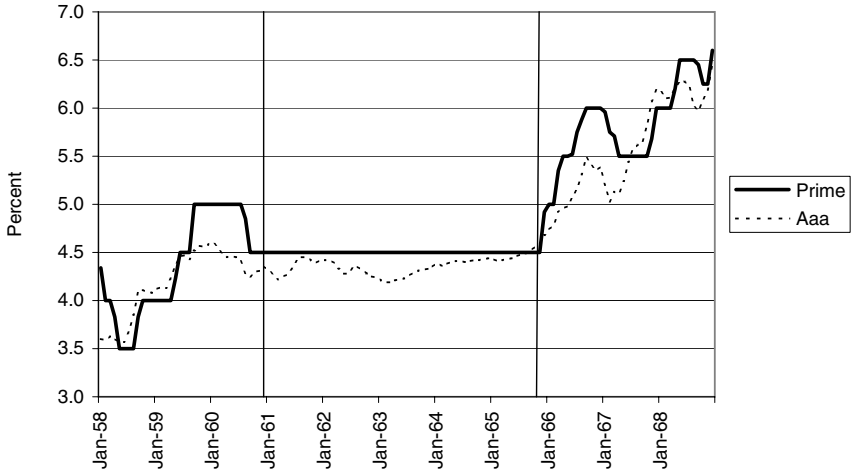


Figure 6. Interest rates 1958 to 1968. Data are from the Federal Reserve Board of Governors. The solid line shows the prime rate on bank loans to the highest quality borrowers. The dashed line shows the average rate on Aaa rated corporate bonds.

With regard to the Credit Crunch, while the Fed's actions in 1966 may have been prompted by robust credit demand, interest rate trends suggest that credit demand remained strong in the post-event period. As seen in Figure 6, despite a brief slowdown in the first half of 1967 (typically attributed to the tight credit conditions), interest rates quickly rebounded and continued to rise throughout the period, even after credit conditions had eased.

Finally, Panel B of Figure 5 shows no evidence that growth opportunities were trending differently for large and small firms in the pre-event period. Additionally, the figure suggests growth opportunities increased for small firms relative to large firms following the crunch. Thus, if anything credit demand grew faster for small firms from the pre- to post-event period, which would again work in the opposite direction of the prediction of Hypothesis 1.

III. Data and Summary Statistics

The data used for the analysis come from three sources: the *Quarterly Financial Report for Manufacturing Corporations* (hereafter QFR) published (until 1982) by the Federal Trade Commission; *Moody's Industrial Manuals*; and the annual Compustat database.

The QFR reports detailed aggregate financial statements for the manufacturing sector as a whole and for nine different size classes based on total book value of assets. Statistics are compiled from a random sample based on confidential company filings. The advantage of this data source over firm-level sources such as Compustat is that outstanding debt is reported separately based on whether it is owed to a bank or nonbank lender. It also provides quarterly data for earlier time periods than are available in Compustat, which begins quarterly coverage for balance sheet variables in 1976. The disadvantage is that it is not available

at the firm level, so the results using this data source rely to some extent on the assumption that manufacturing firms within a given size class are fairly homogenous.

Following Gertler and Gilchrist (1994) and Oliner and Rudebusch (1996) I first use firm size to proxy for access to public debt markets in the tests below. While this may not be a perfect proxy, size is clearly highly correlated with public debt market access. Faulkender and Petersen (2006) show a significant difference in several measures of firm size between Compustat firms with a credit rating and those without. Firm size is also highly significant in their instrumental variables regression of the determinants of public market access. Several papers in the literature on investment–cash flow sensitivity have shown that small firms are more likely to be liquidity constrained than larger firms (see, for example, Fazzari, Hubbard, and Peterson (1988)). Finally, several studies of the determinants of firm lender choice (e.g., Johnson (1997), Krishnaswami, Spindt, and Subramaniam (1999)), show that the proportion of outstanding debt from public sources is strongly correlated with firm size.

For robustness, I also use the predicted probability of having a debt rating, following the methodology of Faulkender and Petersen (2006). That is, I first estimate a probit model of the existence of a credit rating on firm size (log of sales), asset tangibility, profitability, market-to-book ratio, and indicators for whether the firm is listed on the NYSE and included in the S&P 500 index.[7] This model is estimated over the period 1986 to 2000 (the years in which the debt rating variable is available on Compustat). I then apply the estimated coefficients out of sample to generate a predicted probability of public market access for each firm-year from 1958 to 1968 and use this estimated probability as a measure of debt market access.

The Compustat data include two sample sets covering the periods 1958 to 1963 and 1964 to 1968. For consistency with the QFR data, I start with the universe of manufacturing firms (SIC 2000-3999). Faulkender and Petersen (2006) document that only the largest 19% of firms in Compustat have a public debt rating. Therefore, when using the Compustat data, I define firms with (without) bond market access based on the upper (lower) two deciles of either book assets or predicted bond rating probability.[8] These groups are formed at the year-end just preceding each loan shock (1960 for the CD market emergence and 1965 for the Credit Crunch). Firms are then required to have nonmissing leverage data for at least one pre-event and one post-event year to be included in the sample.[9] In addition, in order to focus on firms that would be affected by a reduction in loan supply, for the Credit Crunch sample (1964 to 1968) I require positive leverage in at least one pre-event year.

It is important to note that the universe of firms are those public firms large enough to enter the Compustat database. This is relevant for two reasons. First,

[7] Additional instruments employed by Faulkender and Petersen (2006) are excluded due to limited data availability in the 1960s.

[8] Similar results are obtained with alternate cutoffs, that is, upper and lower quartiles.

[9] Since a large number of smaller firms were added to the Compustat database in 1960, I back-fill firm characteristics for the years 1958 and 1959 using *Moody's Industrial Manuals*.

while the "small" firms are unlikely to have access to public debt markets, they are large enough to have some degree of access to nonbank capital sources (i.e., external equity and nonbank private lenders). Second, the two changes in bank funding constraints affected users of large time deposits, primarily the large money-center banks. Given my sample of firms, the banks most affected by the supply shocks I study are the ones most likely to lend to the firms I study. For example, Budzeika (1971) estimates that in the 1960s two thirds to three quarters of the dollar volume of business loans of New York City banks went to firms with assets of $5 million or more. Firms with assets between $5 million and $25 million accounted for one fifth of the loan volume and those with assets over $100 million accounted for about one third. Thus, at least a third of the loans of New York money-center banks in this time period were likely to firms in the $1 to $10 million range (roughly my small firm group) and about a third were to firms with assets over $100 million (roughly my large firm group).

When using the QFR data, I am limited to using size-based groups. The large firm group is defined as firms with assets greater than $100 million, while the small firm group includes firms with assets between $1 million and $10 million. These size ranges are broadly consistent both with those used by previous researchers employing this data source (e.g., Gertler and Gilchrist (1994)) as well as with the Compustat decile definitions.

In addition, in order to look specifically at substitution towards public debt and to extend the placement structure analysis to the firm level, I hand collect data for a sample of firms from *Moody's Industrial Manuals*. Specifically, I collect data for a random sample of 100 manufacturing firms, 50 each from the top and bottom book asset value deciles of firms in both Moody's and CRSP or Compustat. From the long-term debt schedule, I gather annual information on the dollar value of public and private debt outstanding (including current portion) for each firm-year from 1964 through 1968. I then merge this data with other firm characteristics from either Compustat or Moody's.

Table I displays summary statistics for the small and large firm groups' capital structures over the period 1960 through 1968, which covers both events under study, using the QFR and Moody's data. The table shows that while the leverage ratios for these groups are of similar magnitude, the composition of debt outstanding differs substantially. First, consistent with earlier findings (e.g., Gertler and Gilchrist (1994)), small firms rely more heavily than large firms on short-term financing, the majority of which is likely due to banks. Second, among long-term financing, the small firms rely more heavily on banks as lenders than do large firms. As a result, the percentage of long-term debt due to banks for small firms is more than double that of the large firms. However, it is interesting that even for small firms, bank debt makes up typically less than a third of long-term debt. Thus, while these firms may not have access to public debt markets and are clearly more bank-dependent than the large firms, a significant portion of their financing comes from (presumably private) nonbank lenders (e.g., insurance companies). Finally, as expected, large firms obtain a substantially higher percentage of their debt from public debt markets than do small firms.

Table I
Capital Structure Summary Statistics

Data for the first five rows in each panel are from the *Quarterly Financial Report for Manufacturing*. Small firms include those with book value of assets between $1 million and $10 million; large firms include those with book value of assets greater than $100 million. Data on public debt outstanding are from *Moody's Industrial Manuals* from 1964 through 1968, based on a random sample of 100 firms, 50 each from the highest and lowest book asset deciles of manufacturing firms in both Moody's and Compustat in 1966.

	1960	1962	1964	1966	1968
Panel A: Small Firms					
Total debt/Assets	15.1%	16.7%	18.3%	19.0%	20.5%
ST debt/Assets	6.3%	6.0%	5.9%	6.3%	6.7%
Long-term bank debt/Assets	2.2%	2.6%	3.5%	4.2%	4.7%
Long-term nonbank debt/Assets	6.6%	8.1%	8.9%	8.5%	9.1%
LT bank debt/LT total debt	24.7%	24.4%	27.9%	33.3%	34.2%
LT public debt/LT total debt	n.a.	n.a.	6.7%	5.8%	7.2%
Panel B: Large Firms					
Total debt/Assets	15.7%	15.3%	14.8%	16.5%	20.2%
ST debt/Assets	2.0%	1.7%	1.6%	2.4%	3.0%
Long-term bank debt/Assets	1.7%	1.6%	1.3%	2.1%	2.8%
Long-term nonbank debt/Assets	12.0%	12.0%	11.9%	12.0%	14.4%
LT bank debt/LT total debt	12.2%	11.8%	10.2%	14.9%	16.2%
LT public debt/LT total debt	n.a.	n.a.	34.4%	28.5%	32.1%

IV. Results

A. Leverage Ratios

Returning to Figure 3, we see that changes in average total leverage ratios (calculated using annual Compustat data) following each supply shock show evidence consistent with the prediction in Hypothesis 1. That is, following the introduction of the negotiable CD market, leverage ratios of small firms rose relative to those of large firms, and vice versa following the 1966 Credit Crunch. For both events, these changes to the cross-section of leverage appear to be persistent. While this is not surprising in the case of the CD market emergence, since this can be viewed as a permanent supply shift, it is more surprising with respect to the 1966 Credit Crunch, since credit conditions had eased by the beginning of 1967, as indicated by the dashed vertical line in Panel B. However, as I discuss later in this section, much of this leverage effect resulted from increased public debt issuance by large firms. The timing and persistence of these leverage changes are consistent with the institutional delay involved with floating public bonds as well as the transaction costs (or impossibility) of early retirement.

To test Hypothesis 1 more formally, I estimate equation (1) with respect to each event using the annual Compustat data. As discussed in Section II, I include proxies for firm characteristics and macroeconomic conditions in order to control for firms' demand for different capital structures, and allow the

coefficients to vary across groups. The firm-level control variables chosen are those that Rajan and Zingales (1995) identify as most robustly associated to leverage ratios in previous capital structure studies.[10] These include profitability, which can proxy for either taxable income to be shielded or internal cash available for investment funding; asset tangibility, which proxies for bankruptcy recovery rates; the ratio of the market value to the book value of assets, which proxies for growth opportunities and thus the severity of potential agency costs; and firm size, measured by the log of book assets, which proxies for expected bankruptcy costs and information asymmetry between the firm and investors.[11] I also include the firm-specific annual stock return (unreported) when using market leverage as the dependent variable with little effect on the results.

The macroeconomic control variables are intended to control for time-period effects, other than the event being studied, that may influence capital structure. These include growth in GDP over the previous year, following Kashyap et al. (1993) and Gertler and Gilchrist (1994), and, following Korajczyk and Levy (2003), aggregate nonfinancial corporate profit growth and the equity market return.

The estimation results are presented in Table II. Panel A presents results for the CD market emergence, and Panel B for the 1966 Credit Crunch. Results are presented for both book and market leverage measures and using both size and predicted rating probability to form bond market access groups. The signs and significance of the firm-level control variables are generally consistent with previous capital structure studies (i.e., leverage is negatively correlated with profitability and market-to-book and positively correlated with asset tangibility). In addition, there are often significant differences in these sensitivities across the bond market access groups. Consistent with Faulkender and Petersen (2006), firms without bond market access have lower leverage ratios. Also, consistent with Korajczyk and Levy (2003), firms without bond market access generally have more procyclical leverage than firms with access, although this result is not consistent across all macroeconomic variables and specifications.

However, my primary interest is in the coefficients on the group indicator interacted with the post-event indicator(s). The results indicate strong support for the predicted leverage effect. In all specifications, the difference in differences term is significantly positive following the emergence of the negotiable CD market and negative both during and after the 1966 Credit Crunch.[12] The magnitude of the effect is meaningful as well. The supply shocks account for a relative book leverage change of roughly 1.5 to 2.5 percentage points and a relative market leverage change of 2 to 7 percentage points. These relative leverage changes are roughly 30% to 50% of the average leverage difference across the groups prior to the event.

[10] These also correspond closely to the "Tier 1" factors identified by Frank and Goyal (2004), with the exception of industry leverage and an indicator for positive dividend payments. Results are robust to inclusion of these additional factors.

[11] See the Appendix for precise variable definitions.

[12] Standard errors are adjusted for heteroskedasticity across firms and serial correlation within firms, assuming an AR(1) structure. See Bertrand, Duflo, and Mullainathan (2004).

Table II

Impact of Loan Supply Shocks on Corporate Leverage

The table presents estimates of equation (1) using annual Compustat data from 1958 through 1963 (Panel A) and 1964 through 1968 (Panel B). The sample includes manufacturing firms (SIC codes between 2000 and 3999) with nonmissing leverage for at least one pre-event year and one post-event year. Firms involved in major mergers or acquisitions are excluded. The dependent variable is either the market leverage ratio (first and third columns) or book leverage ratio (second and fourth columns). See the Appendix for all variable definitions. All independent variables are lagged one period. Standard errors, adjusted for heteroskedasticity across firms and serial correlation within firms, assuming an AR(1) structure, are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Emergence of Negotiable CD

	Firm Size		Pr(Rated)	
	Market Leverage	Book Leverage	Market Leverage	Book Leverage
Constant	0.199***	0.193***	0.204***	0.213***
	(0.011)	(0.009)	(0.013)	(0.009)
No Access	−0.092***	−0.036*	−0.075***	−0.029*
	(0.023)	(0.02)	(0.02)	(0.016)
CD Period	−0.006*	−0.011***	−0.004	−0.009***
	(0.003)	(0.002)	(0.004)	(0.003)
No Access ∗ PostCD	0.027***	0.018**	0.018**	0.015**
	(0.01)	(0.008)	(0.008)	(0.007)
Profitability	−0.444***	−0.226***	−0.437***	−0.265***
	(0.042)	(0.034)	(0.049)	(0.039)
Profitability × No Access	0.333***	0.203***	0.235***	0.07
	(0.068)	(0.062)	(0.063)	(0.056)
Tangibility	0.08***	0.057***	0.075***	0.064***
	(0.019)	(0.017)	(0.02)	(0.016)
Tangibility × No Access	−0.084**	−0.068*	−0.076**	−0.082***
	(0.038)	(0.036)	(0.034)	(0.026)
MA/BA	−0.017***	−0.008***	−0.025***	−0.02***
	(0.003)	(0.002)	(0.003)	(0.003)
MA/BA × No Access	0.005	0.007**	0.013***	0.014***
	(0.004)	(0.003)	(0.004)	(0.004)
GDP Growth	0.249***	−0.12**	0.283***	−0.055
	(0.073)	(0.049)	(0.085)	(0.08)
GDP Growth × No Access	0.994***	0.426**	0.338	0.02
	(0.249)	(0.199)	(0.21)	(0.183)
Corp Profit Growth	0.021*	0.012*	0.013	0.011
	(0.011)	(0.007)	(0.013)	(0.013)
Corp Profit × No Access	−0.087***	−0.047*	−0.018	0.001
	(0.033)	(0.025)	(0.03)	(0.024)
Market Return	−0.095***	−0.06***	−0.065***	−0.041**
	(0.017)	(0.011)	(0.021)	(0.019)
Market Return × No Access	0.252***	0.062	0.159***	0.015
	(0.048)	(0.038)	(0.041)	(0.035)
N	1,510	1,518	1,389	1,389
Model χ^2	430.5	143.3	405.7	275.1
p-value	0.00	0.00	0.00	0.00

(*continued*)

Table II—*Continued*

Panel B: 1966 Credit Crunch				
	Firm Size		Pr(Rated)	
	Market Leverage	Book Leverage	Market Leverage	Book Leverage
Constant	0.221***	0.208***	0.237***	0.219***
	(0.012)	(0.01)	(0.013)	(0.011)
No Access	−0.02	−0.04*	−0.092***	−0.066***
	(0.022)	(0.02)	(0.023)	(0.021)
Crunch	0.039***	0.028***	0.034***	0.024***
	(0.006)	(0.005)	(0.007)	(0.005)
Post Crunch	0.044***	0.04***	0.043***	0.042***
	(0.005)	(0.004)	(0.005)	(0.004)
No Access ∗ Crunch	−0.048***	−0.023**	−0.041***	−0.019**
	(0.012)	(0.01)	(0.011)	(0.009)
No Access ∗ Post Crunch	−0.066***	−0.017*	−0.07***	−0.022**
	(0.01)	(0.009)	(0.01)	(0.009)
Profitability	−0.441***	−0.29***	−0.464***	−0.324***
	(0.049)	(0.045)	(0.053)	(0.049)
Profitability × No Access	0.099	0.199***	0.279***	0.303***
	(0.072)	(0.064)	(0.072)	(0.065)
Tangibility	0.13***	0.112***	0.097***	0.091***
	(0.019)	(0.017)	(0.021)	(0.02)
Tangibility × No Access	−0.147***	−0.086**	0.045	0.008
	(0.037)	(0.039)	(0.035)	(0.038)
MA/BA	−0.042***	−0.022***	−0.042***	−0.023***
	(0.003)	(0.003)	(0.003)	(0.003)
MA/BA × No Access	0.032***	0.022***	0.032***	0.021***
	(0.004)	(0.004)	(0.004)	(0.004)
GDP Growth	0.328**	0.119	0.239	0.117
	(0.157)	(0.119)	(0.159)	(0.12)
GDP Growth × No Access	−0.234	0.143	−0.196	0.012
	(0.322)	(0.269)	(0.309)	(0.256)
Corp Profit Growth	0.024	−0.04*	0.045	−0.02
	(0.03)	(0.022)	(0.03)	(0.022)
Corp Profit × No Access	0.176***	0.039	0.148***	0.029
	(0.058)	(0.045)	(0.056)	(0.043)
Market Return	0	−0.105***	0.036	−0.072**
	(0.038)	(0.028)	(0.039)	(0.028)
Market Return × No Access	0.348***	0.216***	0.362***	0.2***
	(0.06)	(0.054)	(0.066)	(0.053)
N	2,120	2,291	2,120	2,289
Model χ^2	1,133.4	410.7	945.5	379.9
p-value	0.00	0.00	0.00	0.00

B. Sources of Capital

In order to understand more deeply the mechanisms driving the results in the previous subsection, as well as to show consistency with the role of loan supply effects, the remainder of this section examines the relative degree and patterns

of substitution among financing sources following the loan supply shocks. In the first subsection I study substitution between debt and both internal and external equity capital. In the following two subsections, I examine the substitution among various suppliers of credit.

The degree to which we observe firms substituting across suppliers of capital has several implications. First, as discussed in the context of Figure 2 above, changes in the mix of debt sources accessed can provide further evidence that the events studied and leverage effects documented above are in fact associated with shocks to bank loan supply. Second, as discussed in Section II.A, the relative degree of substitution among debt sources can enhance our understanding of the relative roles of differential changes in lending terms and differential access to nonbank debt capital. That is, do the results in the previous section simply reflect capital constraints on the part of the smaller firms, or do they reflect differences in substitution among alternate capital sources? Such substitution is likely to mitigate the capital constraints often associated with supply shocks (e.g., Kashyap et al. (1994), Lemmon and Roberts (2007)). Finally, such an analysis is important in determining whether supply factors are relevant to the growing literature that studies the determinants of firms' debt placement structures.[13]

B.1. Equity Financing

If firms face limited availability or a relatively higher price of debt, there are several options for substitution towards equity financing: reliance on internal funds (i.e., internal equity), issuance of external equity, or using a combination of debt and external equity to fill their financing needs. To examine such substitution, I examine the effect of the credit supply shocks on the propensity of firms to issue debt relative to these three forms of complete or partial equity finance. In Table III, I estimate a multinomial logit model of similar form to equation (1), where the dependent variable takes the values of zero for internal finance, one for a debt issuance, two for an equity issuance, and three for a dual (both debt and equity) issuance. Following Hovakimian, Opler, and Titman (2001), Korajczyk and Levy (2003), and Leary and Roberts (2005), I define a debt issuance as a net increase in total (short-term plus long-term) debt outstanding greater than 1% of beginning-of-year book assets. Following Fama and French (2005), an equity issuance is defined as the product of (1) the split-adjusted growth in shares and (2) the average of the split-adjusted stock price at the beginning and end of the fiscal year in excess of 1% of book assets. In the estimation, debt issuance is the excluded group, so the estimated coefficients represent the effect of each covariate on the probability of a firm accessing each form of equity financing relative to debt.

Firm control variables include all those used in Table II, measured at the beginning of the fiscal year, plus the firm-specific stock return and the level

[13] See, for example, Johnson (1997), Krishnaswami et al. (1999), Cantillo and Wright (2000), and Denis and Mihov (2003).

Table III

Impact of Loan Supply Shocks on Financing Choice

The table presents estimates of a multinomial logit model of financing choice. The dependent variable takes on the values of zero for internal financing, one for external debt issuance, two for external equity issuance and three for a dual issuance. A debt issuance is defined as a net increase in total (short-term plus long-term) debt outstanding greater than 1% of beginning-of-year book assets. An equity issuance is defined as the product of (1) the split-adjusted growth in shares and (2) the average of the split adjusted stock price at the beginning and end of the fiscal year, in excess of 1% of book assets. In the results presented, debt issuances are the omitted group. See the Appendix for other variable definitions. The sample is the same as in Table II. Standard errors, adjusted for clustering at the firm level, are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Emergence of Negotiable CD

	Internal Funds	External Equity	Dual Issuance
Constant	−8.26**	−4.92	−11.92***
	(3.92)	(3.81)	(4.23)
No Access	8.56	2.81	12.59**
	(5.34)	(5.56)	(6.13)
CD Period	0.6	0.45	1.62***
	(0.41)	(0.58)	(0.62)
No Access ∗ PostCD	−1.25*	−2.31***	−2.2**
	(0.68)	(0.89)	(0.98)
Tangibility	1.84***	1.02	2.67**
	(0.66)	(0.89)	(1.14)
Tangibility × No Access	−0.85	−0.42	−3.77**
	(1.24)	(1.48)	(1.79)
Profitability	−0.6	2.04	2.42
	(2.38)	(3.95)	(4.2)
Profitability × No Access	1.4	−3.18	−1.35
	(2.84)	(4.42)	(4.65)
MA/BA	0.49**	0.95***	0.68**
	(0.25)	(0.31)	(0.32)
MA/BA × No Access	−0.43	−0.47	−0.24
	(0.31)	(0.34)	(0.35)
Stock Return	0.04	1.17*	2.9***
	(0.46)	(0.6)	(0.62)
Stock Return × No Access	−0.55	−1.25*	−2.42***
	(0.57)	(0.69)	(0.7)
Leverage	−3.63***	0.56	3.76**
	(0.89)	(1.22)	(1.56)
Leverage × No Access	3.46**	3.2*	0.55
	(1.58)	(1.78)	(2.09)
GDP Growth	16.49	−10.04	−0.78
	(10.2)	(9.78)	(10.73)
GDP Growth × No Access	−20.96	−4.03	−22.51
	(13.93)	(14.57)	(15.3)
Default Spread	11.36**	4.55	10.89**
	(4.96)	(4.89)	(5.37)
Default Spread × No Access	−11.37*	−3.16	−11.02
	(6.73)	(7.14)	(7.75)
Term Spread	−0.35	−0.44	−0.82*
	(0.34)	(0.47)	(0.48)

(*continued*)

Table III—*Continued*

Panel A: Emergence of Negotiable CD			
	Internal Funds	External Equity	Dual Issuance
Term Spread × No Access	0.75	1.64**	0.37
	(0.57)	(0.73)	(0.77)
Market Return	−0.46	0.4	−4.12
	(2.41)	(3.76)	(3.06)
Market Return × No Access	3.64	−1.18	1.15
	(3.12)	(4.44)	(3.78)
N	1,125		
Model χ^2	317.8		
p-value	0.000		

Panel B: 1966 Credit Crunch			
	Internal Funds	External Equity	Dual Issuance
Constant	−0.42	−1.38	−0.71
	(1.36)	(1.78)	(1.73)
No Access	1.61	3.27	0.81
	(2.02)	(2.59)	(2.68)
Crunch	0.53	0.33	1.08**
	(0.55)	(0.63)	(0.49)
Post Crunch	−2.3***	−1.89**	−1.05
	(0.7)	(0.81)	(0.71)
No Access ∗ Crunch	−0.7	0.53	−1.48**
	(0.68)	(0.86)	(0.7)
No Access ∗ Post Crunch	2.3***	1.95*	2.34**
	(0.84)	(1.05)	(0.94)
Tangibility	−0.17	−1.61**	−0.71
	(0.5)	(0.79)	(0.71)
Tangibility × No Access	0.2	0.51	0.02
	(0.88)	(1.18)	(1.13)
Profitability	−0.25	0.32	−1.1
	(2.54)	(2.35)	(2.5)
Profitability × No Access	1	1.71	3.4
	(2.74)	(2.71)	(2.76)
MA/BA	−0.06	0.75***	0.62***
	(0.2)	(0.17)	(0.19)
MA/BA × No Access	0.13	−0.29	−0.15
	(0.25)	(0.23)	(0.24)
Stock Return	−0.05	2.22***	1.93***
	(0.37)	(0.42)	(0.42)
Stock Return × No Access	−0.16	−2***	−1.57***
	(0.41)	(0.45)	(0.46)
Leverage	−1.72**	2.85**	3.89***
	(0.86)	(1.1)	(1.11)
Leverage × No Access	1.82	−0.98	−3.02**
	(1.12)	(1.32)	(1.3)
GDP Growth	−23.21	−42.34*	−36.59**
	(17.62)	(22.01)	(17.32)

(*continued*)

Table III—*Continued*

Panel B: 1966 Credit Crunch			
	Internal Funds	External Equity	Dual Issuance
GDP Growth × No Access	10.74	−7.59	24.43
	(23.09)	(30.92)	(26.3)
Default Spread	5.18***	2.79	2.09
	(1.95)	(2.1)	(2.24)
Default Spread × No Access	−5.7**	−4.23	−4.34
	(2.57)	(2.91)	(3.26)
Term Spread	0.03	−0.57	−1.26***
	(0.37)	(0.49)	(0.41)
Term Spread × No Access	0.02	−0.18	0.83
	(0.53)	(0.68)	(0.62)
Market Return	−0.75	6.11	−2.95
	(4.24)	(4.23)	(4.21)
Market Return × No Access	0.26	−9.18*	1.71
	(5.01)	(5.54)	(5.37)
N	1,889		
Model χ^2	407.8		
p-value	0.000		

of leverage. In addition to GDP growth, I follow Koraczyk and Levy (2003) in using the annual equity market return, default spread, and term spread as macroeconomic controls. Again, coefficients on all dependent variables are allowed to vary across firm groups. For brevity, only results using the bond rating probability rankings are shown. Similar results are obtained using firm size groups.

The primary variable of interest is again the interaction of the No Access indicator and the post-event indicators. The results support the prediction of Hypothesis 2. The negative coefficients on this variable in Panel A suggest that firms without bond market access are relatively less likely to use all forms of equity financing (relative to debt) following the loan supply expansion associated with the emergence of the negotiable CD, though the relation is statistically weak (p-value of 0.066) in the case of internal funds. Similarly, the positive coefficient on the No Access × Post Crunch interaction suggests that firms without bond market access are relatively *more* likely to use all forms of equity financing following the loan supply contraction associated with the 1966 Credit Crunch (here the relation is statistically weak—p-value of 0.063—for external equity). Note that this effect is not present until the year following the official Credit Crunch (post-crunch period). Such a delay is perhaps not surprising given the likely delay involved with switching financing sources and the fact that debt financing was generally abundant in the first half of 1966. While there are certainly other motivations for financing choices, as reflected by the significant coefficient estimates on the proxies for the market-to-book ratio, stock return, and leverage ratio, these results suggest that, at the margin, the use of both internal and external equity is influenced by prevailing credit conditions.

B.2. Bank vs. Nonbank Debt

Above, Figure 2 shows that the use of bank debt relative to nonbank debt in the aggregate increased following the CD emergence and decreased following the Credit Crunch, consistent with the direction of these supply movements. In this section, I study how these effects vary across firms with and without bond market access. Summary statistics for the movements of bank and nonbank debt based on data from the QFR are shown in Figure 4. Each chart shows changes in the ratio for each group of firms (small and large) relative to the beginning of the event period. The left column depicts data from the emergence of the negotiable CD market and the right column depicts data from the period surrounding the 1966 Credit Crunch. Panels A and B chart movements in the ratio of bank debt to assets that are consistent with the role of supply factors. That is, after supply constraints were eased by the emergence of the negotiable CD market, we see a pronounced increase in the use of bank debt by small firms relative to large firms. Similarly, during and for the first year after the 1966 Credit Crunch, we see a relative drop in the bank debt to asset ratio of the small firm group. Panels C and D show that before the emergence of the CD market, small firms filled any demand for additional debt through nonbank sources, while, following the 1966 Credit Crunch, it was the large firms that turned increasingly to nonbank debt.

These movements are summarized in Panels E and F, which show the ratio of long-term bank debt to total long-term debt for each group. Here again we see that, consistent with the supply movements, the relative ratios move in opposite directions following the two events. Also, the CD market emergence, which represented a permanent supply shift, is associated with a persistent relative change in the bank debt mix, while the temporary Credit Crunch led to a temporary relative change. Even in the latter case, however, the difference persisted for at least a year after the crunch was officially over.

As discussed in Section II, the predicted *relative* changes in debt source mix between bank-dependent and public access firms depend on the role of banks' response (differential changes in lending terms) versus firms' response (differential substitution across capital suppliers). If loan availability changes more for small bank-dependent firms than for larger public access firms, the bank debt mix should be more sensitive to loan supply movements for these smaller firms. If different substitution patterns are dominant, however, the opposite should hold. To investigate Hypothesis 3, I use a version of equation (1) in which the dependent variable is long-term bank debt as a percent of total long-term debt. Given this specification, Hypothesis 3(a) requires a significant positive (negative) coefficient on the interaction between the bank-dependent indicator and the post-event indicator for the emergence of the negotiable CD market (1966 Credit Crunch). Hypothesis 3(b) requires the opposite.

The firm-specific control variables are chosen for consistency with previous studies of the placement structure of debt, such as Johnson (1997) and Cantillo and Wright (2000). These studies view the choice of lender as a function of the trade-off between the adverse selection and agency costs of arm's length debt

and the compensation required by banks for their monitoring and renegotiating services. Firm size proxies for the degree of information asymmetry between the firm and investors.[14] The ratio of the market value of assets to the book value of assets proxies for a firm's growth opportunities, which measures the severity of potential agency conflicts. Leverage proxies for the amount of equity-at-risk that influences managers' incentives, as in Hoshi, Kashyap, and Scharfstein (1993).[15] Earnings volatility proxies for the riskiness of a firm's assets and resulting need for monitoring.

I estimate the bank mix equation using data from the QFR, since this breaks long-term debt outstanding into bank and nonbank components. Since these data are given at the size-stratification level, rather than the firm level, I treat each size stratification as an individual firm. The two smallest strata (excluding firms with assets less than $1 million) are included in the bank-dependent group, while the public market access group consists of the three largest strata. The equation is then estimated using 6 years of quarterly data for each strata.

The estimation results are shown in Table IV, which is analogous to Table II. The first column presents results for the negotiable CD innovation and the second for the 1966 Credit Crunch. The results show support for Hypothesis 3(a). The coefficients on the bank-dependent indicator interacted with the post-event indicator are significantly positive following the emergence of the CD market and significantly negative both during and after the 1966 Credit Crunch. Thus, even after controlling for firms' demand for different debt sources and other economic conditions that may influence placement structure (see Cantillo and Wright (2000)), the proportion of debt due to banks increases (decreases) for bank-dependent firms *relative* to firms with public market access following expansions (contractions) of bank loan supply. The impact is also economically significant. The difference in differences estimates range from four to five percentage points, relative to an average long-term bank percent of 24% to 33% for the bank-dependent firms.

These results suggest that lending terms for large firms are less affected by loan supply shocks than those for small firms. This is consistent with the evidence in Figure 6, which shows that the prime rate remained flat through the early 1960s. Thus, the new CD funding channel appears to have impacted bank borrowing by small firms either through a change in nonprice credit terms or through a change in the spread over prime charged to these riskier borrowers. However, as discussed in Section II, support for Hypothesis 3(a) does not rule out an additional role for cross-sectional differences in capital source substitution in affecting relative financial structures. The results on debt-equity issuance choice are consistent with this mechanism. To find additional evidence of this channel, we turn now to the public-private debt choice.

[14] Given the high correlation between firm size and my proxy for bank dependency and public market access, I exclude firm size from the regressions when the firm group indicator is included. However, results in this and the following sections are robust to the inclusion of the firm size proxy.

[15] Given the correlation between leverage and the other included independent variables, I follow Johnson (1997) in first regressing leverage on the other included variables and using the residuals from that regression as an instrument for leverage.

Table IV

Percentage of Debt Owed to Banks

Data are from the *Quarterly Financial Report for Manufacturing* from 1958Q4 through 1963Q4 (Panel A) and 1963Q4 through 1968Q4 (Panel B). Small firms include those with book value of assets between \$1 million and \$10 million; large firms include those with book value of assets greater than \$100 million. The dependent variable is long-term bank debt as a percent of total long-term debt outstanding. *LevResid* is the residual from a regression of total leverage ratio on the other included firm-specific independent variables. Other variables are as defined in the Appendix. Standard errors, adjusted for heteroskedasticity across firms and serial correlation, assuming an AR(1) structure, within firms are shown in parentheses. * and *** denote significance at the 10% and 1% levels, respectively.

	Introduction of Negotiable CD		1966 Credit Crunch
Constant	0.265***	Constant	0.096
	(0.066)		(0.084)
No Access	0.531***	No Access	0.031
	(0.202)		(0.194)
CD Period	−0.007	Crunch	0.03***
	(0.007)		(0.009)
		Post Crunch	0.055***
			(0.013)
NoAcc ∗ CDPeriod	0.046***	NoAcc ∗ Crunch	−0.043***
	(0.014)		(0.015)
		NoAcc ∗ Post Crunch	−0.056***
			(0.021)
MA/BA	−0.009	MA/BA	0.063*
	(0.026)		(0.033)
MA/BA × No Access	−0.015	MA/BA × No Access	−0.039
	(0.029)		(0.034)
Tangibility	−0.524***	Tangibility	−0.208
	(0.145)		(0.158)
Tangibility × No Access	−0.633	Tangibility × No Access	0.652
	(0.656)		(0.611)
LevResid	0.179	LevResid	0.125
	(0.193)		(0.189)
LevResid × No Access	0.058	LevResid × No Access	0.358
	(0.377)		(0.416)
Earnings Volatility	14.598***	Earnings Volatility	−1.253
	(3.102)		(5.407)
EarnVol × No Access	−31.652***	EarnVol × No Access	6.091
	(9.059)		(7.833)
GDP Growth	−0.092	GDP Growth	0.488*
	(0.198)		(0.271)
GDP Growth × No Access	0.037	GDP Growth × No Access	−0.316
	(0.462)		(0.463)
Corp Profit Growth	−0.004	Corp Profit Growth	−0.036
	(0.023)		(0.045)
Corp Profit × No Access	0.019	Corp Profit × No Access	−0.024
	(0.056)		(0.079)
Market Return	−0.012	Market Return	−0.022
	(0.023)		(0.029)
Market Return × No Access	0.047	Market Return × No Access	0.012
	(0.046)		(0.049)
N	105		105
Model χ^2	1405.4		602.3
p-value	0.000		0.000

Table V

Average Change in Debt Surrounding the 1966 Credit Crunch

Data are from *Moody's Industrial Manuals* from 1964 through 1969. The small (large) firms group consists of a random sample of 50 firms from the lowest (highest) book asset decile of manufacturing firms in both Moody's and Compustat in 1966. All figures expressed as a percent of book assets.

		Long-Term Debt			
			Public		
Year	Short-Term Debt	Private	Straight	Conv	Total
		Panel A: Small Firms			
1965	0.000	3.58	0.16	−0.20	−0.04
1966	0.003	−0.21	−0.02	−0.34	−0.37
1967	−0.001	−0.54	0.00	0.04	0.04
1968	−0.001	1.45	0.00	0.84	0.84
		Panel B: Large Firms			
1965	0.001	1.69	0.29	−0.18	0.11
1966	0.001	2.75	−0.19	0.42	0.23
1967	0.001	2.16	2.42	0.06	2.48
1968	0.000	1.53	0.41	0.85	1.26

B.3. Public vs. Private Debt

In addition to choosing between bank and nonbank debt, firms also choose between public and private debt sources. This distinction is of interest because while bank-dependent firms, as defined in the previous section, may have access to private nonbank sources of debt, their access to public debt markets is likely limited. Therefore, in response to a contraction in the supply of loanable funds, one would expect firms with access to public markets to substitute towards public debt to a significantly greater degree than bank-dependent firms, insofar as the relative prices are affected. Given the lack of evidence of a decrease in nonbank debt usage by large firms following the emergence of the bank CD (see Figure 4), I limit my focus in this section to the 1966 Credit Crunch event. Also, for ease of exposition, I redefine the experimental group to consist of the large firms with public market access and the control group to consist of the small, bank-dependent firms.

In order to investigate the choice between public and private debt, in this section I use the data collected from Moody's manuals described earlier. Table V and Figure 7 report summary statistics. Panel A of Table V and Panels A and D of Figure 7 show a substantial drop in private debt issuance by small firms during and for the first year after the Credit Crunch. Large firms, however, continued to be able to issue private debt throughout the period. Nonetheless, we see a sharp increase in the use of public debt by these large firms following the Credit Crunch (Table V, Panel B, and Figure 7, Panels B and E). While public debt accounted for only 7% of the net debt issuance in the two years leading up to the Credit Crunch, it accounted for roughly 50% in the two

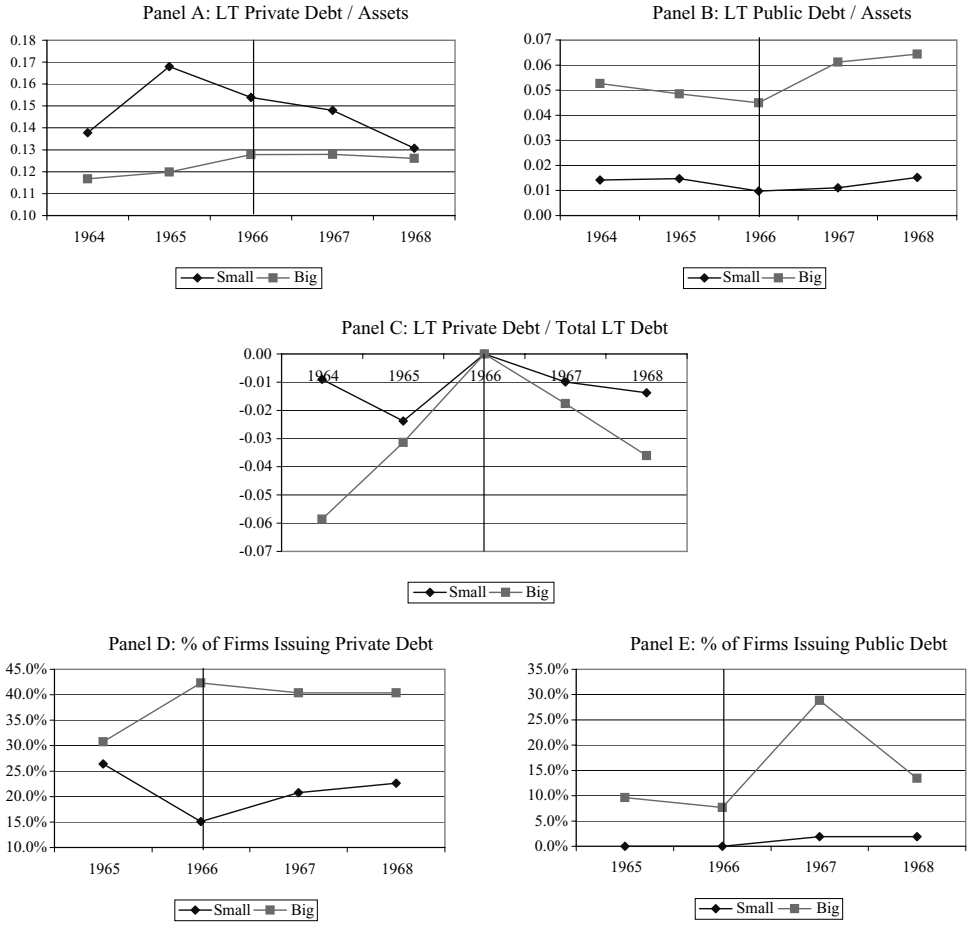


Figure 7. Public and Private Financing Surrounding the 1966 Credit Crunch. Data are from *Moody's Industrial Manuals* from 1964 through 1969. The small (large) firms group consists of a random sample of 50 firms from the lowest (highest) book asset decile of manufacturing firms in both Moody's and Compustat. Panels A and B are presented in levels; Panel C is presented in absolute changes relative to 1966. In Panel D (E), an issuance is defined as a net increase in private (public) debt outstanding of at least 1% of assets.

years after. As a result, we see a sharp shift in the ratio of private to public debt at the Credit Crunch (Figure 7, Panel C), which is more pronounced for the large firms.

Comments from the business press clearly attribute this increased use of public debt to the limited availability of bank loans during the Credit Crunch. For example, the *Investment Dealers' Digest*, in its 10-year review of corporate financing activity published in 1970, stated:

> Why this almost 30% increase in public financing during 1966? The big suppliers of funds—banks and institutions—found themselves in the

> throes of a tight money situation and were forced to ration available monies (p. 18).

To test for public–private substitution, I estimate a version of equation (1) with public debt as a percent of total long-term debt as the dependent variable.[16] The results, based on the annual Moody's sample from 1964 through 1968, are shown in Table VI. The first column reports results of the estimation using only large firms and the second column reports the difference in differences specification. The positive and significant coefficient on the post-crunch indicator in column (1) indicates that these firms were more likely to access public debt relative to other debt sources following the negative bank supply shock, even after controlling for demand factors and economic conditions. The effect is slightly mitigated, both in magnitude and statistical significance in comparison with the smaller firms (column (2)), as these firms also tried to substitute toward public debt to the extent they were able. As shown in Table V, however, all of this public debt issued by the small firms was in the form of convertible debt, while the bulk of the public debt issued by the large firm group was nonconvertible. While the evidence in the previous section suggested that small firms bear the brunt of any changes in loan supply, the increased use of public debt following the Credit Crunch suggests that large firms were not immune from the adverse supply movements. Therefore, the degree of access to public debt sources leads to cross-sectional differences in firms' responses and is thus relevant for understanding capital structure.

These results are again consistent with the interest rate movements seen in Figure 6. While rates were rising throughout the period, we can see that the spread between the prime bank rate and the rate on Aaa-rated public debt increased when the Credit Crunch hit, pushing firms with access into the public markets.

This substitution toward public debt is also a likely explanation for the persistence of the leverage effect into the post-crunch period for several reasons. First, many public bond issues come with covenants restricting the firm's ability to call or retire the debt within a set number of years from issue. Second, the move to public debt is associated with higher transaction costs, which have been shown by prior studies (e.g., Fischer, Heinkel and Zechner (1989), Leary and Roberts (2005)) to be associated with larger issuances and less frequent rebalancing. Finally, anecdotal evidence suggests the shock may have had a lasting impact on managers' attitudes toward (arguably more flexible) bank debt. For example, in a February 1968, article, *Fortune* magazine reported:

> The Credit Crunch of 1966 was, and is, still a very fresh memory in corporate boardrooms, and many managements have felt obliged over the last year to lock up some long-term money, in the process reducing their dependence on banks. In close to two-thirds of the big bond issues of 1967,

[16] Because the parallel trend assumption is violated in Panel C of Figure 7, I remove the pre-event trend from these debt mix variables as well.

Table VI

Impact of Credit Crunch on Public Debt Issuance

Data are from *Moody's Industrial Manuals* from 1964 through 1969. The small firms group consists of a random sample of 50 firms from the lowest book asset decile of manufacturing firms in both Moody's and Compustat; the large firm group consists of a similar random sample from the upper decile. The dependent variable is long-term public debt as a percent of total long-term debt outstanding. Other variables are defined in the Appendix. The estimation in column (1) includes only firms in the large size group (public access). Column (2) presents a difference in differences specification including both large and small firms. Standard errors, adjusted for heteroskedasticity across firms and serial correlation, assuming an AR(1) structure, within firms are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	Large firms only	Large vs. small firms
Public Access		0.437***
		(0.154)
Crunch	0.011	0.006
	(0.042)	(0.008)
Post Crunch	0.159**	0.018
	(0.077)	(0.019)
Public Access ∗ Crunch		0.011
		(0.038)
Public Access ∗ Post Crunch		0.136*
		(0.073)
MA/BA	−0.023	0.0005
	(0.017)	(0.005)
MA/BA × No Access		−0.021
		(0.017)
Tangibility	0.133	−0.005
	(0.115)	(0.039)
Tangibility × No Access		0.159
		(0.123)
Leverage	−0.022	0.001
	(0.131)	(0.03)
Leverage × No Access		−0.008
		(0.134)
GDP Growth	−2.219*	−0.163
	(1.226)	(0.418)
GDP Growth × No Access		−1.917
		(1.207)
Corp Profit Growth	0.249	−0.003
	(0.25)	(0.086)
Corp Profit × No Access		0.221
		(0.243)
Default Spread	−0.419	−0.04
	(0.268)	(0.059)
Default Spread × No Access		−0.349
		(0.251)
Market Return	0.757	0.039
	(0.692)	(0.089)
Market Return × No Access		0.627
		(0.637)
Constant	0.51***	0.037
	(0.158)	(0.044)
N	234	395
Model χ^2	16.9	172.0
p-value	0.051	0.000

> at least part of the proceeds were to be used for retiring short-term debt, most of it owed to banks (p. 123).

Such an attitudinal shift is consistent with evidence in Graham and Narasimhan (2004), who document persistent low debt usage after the Great Depression, but only for firms in which the president had not changed since that shock.

Overall, the evidence in this section suggests that a supply shock in one segment of the capital markets results in substitution among financing sources, with the degree and direction of this substitution varying significantly across firms. Following a shock to loan supply, firms with access turn more heavily to public debt markets, while firms without fill more of their financing needs with a combination of nonbank private debt, convertible debt, and both internal and external equity. The resulting differential changes in financial structure generate the leverage effects documented above.

V. Alternative Credit Condition Proxies

A natural question is whether the effects documented above are unique to the particular supply shocks studied or whether they apply to loan supply movements more generally.[17] The advantage of studying specific episodes is the ability to collect firm-level data on the source of debt financing as well as to focus on time periods for which changes in the supply of loanable funds can be more clearly identified. However, to show applicability of the results to a broader time period, in this section I perform an analysis similar to that of Section III.A using a much broader sample and several alternate proxies for changes in bank loan supply.

For the first proxy, I employ a direct measure of the willingness of banks to extend loans, taken from the Federal Reserve Board's Senior Loan Officer Opinion Survey on Bank Lending Practices. The Fed surveys most large commercial banks quarterly and asks how they have changed their "standards of creditworthiness for loans to nonfinancial businesses" and "willingness to make term loans to businesses."[18] According to Schreft and Owens (1991, p. 29), the survey's design is based on the rationale that "banks first respond to changes in the cost and availability of loanable funds by changing nonprice lending terms and conditions of lending," suggesting this is a plausible proxy for loan supply. Lown and Morgan (2006) present evidence that changes in these lending standards are strongly correlated with bank loan changes and real output and are more important than interest rates in explaining them. They also show

[17] For example, the recent study by Lemmon and Roberts (2007) finds a significant relative reduction in debt financing for junk-bond dependent firms following the liquidity shock in that market in the late 1980s. However, they find little evidence of the type of substitution across financing sources seen in the episodes studied here.

[18] The nature of these questions and sample size have changed slightly since the survey was begun in 1967. The survey was also suspended from 1984:Q1 until 1990:Q2, leading to a gap in the data when using this proxy.

(weak) evidence that the survey standards capture changes in loan supply after controlling for demand.

The second proxy is the measure of loan supply changes suggested by Kashyap et al. (1993), the change in the ratio of aggregate bank debt to total corporate debt. This measure is computed from Flow of Funds Accounts data as bank loans divided by the sum of bank loans, commercial paper, and corporate bonds, as in Figure 2. A higher (lower) value is associated with expanded (contracted) loan supply.

The third and fourth proxies are measures of the stance of monetary policy. The first of these is an indicator for years containing a "Romer date," periods defined in Romer and Romer (1990) in which, based on a reading of FOMC minutes, the Fed appears to have shifted to a tighter monetary policy. The second is the spread between the federal funds rate and the rate on 10-year constant maturity Treasury bonds,[19] as suggested by Bernanke and Blinder (1992). Proponents of the bank lending channel of monetary policy have argued that policy shocks influence economic activity by reducing the supply of bank loans due to the drain on bank reserves. Opponents have countered that this effect is less important when banks have ready access to capital sources that are not subject to reserve requirements. Nevertheless, to the extent that these sources are imperfect substitutes for reservable funds, there may still be an impact to loan supply.[20]

Using these proxies, I estimate an expanded version of the primary regression in Faulkender and Petersen (2006), which has the form

$$Lev_{it} = \alpha + \gamma * PubAccess_{it} + X'_{it}\beta + \epsilon_{it}, \tag{2}$$

where Lev_{it} is market (or book) leverage, $PubAccess_{it}$ is a proxy for a firm's access to the public debt markets, and X_{it} is a vector of firm characteristics designed to capture variation in firm demand for debt. I modify the regression specification in (2) to include interaction terms between public debt market access and the various proxies for changes in bank loan supply. I also include the additional macroeconomic controls used in Section III.A. All loan supply proxies and macroeconomic variables are lagged one period to reduce endogeneity concerns.

The sample used to estimate equation (2) is taken from Compustat from 1965 through 2000. Bond market access is defined in a similar manner as above. In each year, firms in the upper 30% of the distribution of book assets, or the predicted probability of having a bond rating from a first-stage probit model (as discussed in Section II.C), are defined as those with public market access and those in the bottom 30% as those without. For brevity, I report only results based on the predicted bond rating probability rankings, though results based on size rankings are very similar.

The results with market leverage as the dependent variable are shown in Table VII. The estimated coefficients on the interaction between the bond

[19] Both interest rate series are obtained from the Federal Reserve Board's website, http://www.federalreserve.gov/releases/his/data.htm.

[20] See Stein (1998) and the discussion in Kashyap and Stein (2000).

Table VII

Capital Structure and Credit Market Conditions

The table presents estimates of equation (2) using annual Compustat data from 1965 through 2000. The dependent variable is the sum of short-term and long-term debt divided by the market value of assets. *Access* is an indicator equal to one (zero) for firms in the upper (lower) three deciles of the predicted probability of bond market access in each year. The predicted probabilities are attained from a first-stage probit model of the existence of a bond rating following Faulkender and Petersen (2006). Other variables are defined in the Appendix. Robust standard errors, adjusted for clustering at the firm level, are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Constant	0.266***	0.264***	0.265***	0.316***	0.26***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)
Access	0.028***	0.034***	0.028***	−0.004	0.028***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Access × Standards		0.015***			
		(0.001)			
Access × Bank Mix			−0.008***		
			(0.001)		
Access × Romer				0.011***	
				(0.002)	
Access × FedFund Spread					0.013***
					(0.001)
Firm Size	−0.01***	−0.01***	−0.01***	−0.004***	−0.009***
	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Firm Age	−0.002	−0.002	−0.002	−0.009***	−0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Profitability	−0.01***	−0.009***	−0.009***	−0.023***	−0.009***
	(0.001)	(0.002)	(0.001)	(0.004)	(0.001)
Tangibility	0.173***	0.174***	0.174***	0.173***	0.173***
	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)
MA/BA	−0.019***	−0.018***	−0.019***	−0.044***	−0.019***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
R&D expense	−0.03***	−0.027***	−0.03***	−0.061***	−0.03***
	(0.003)	(0.003)	(0.003)	(0.011)	(0.003)
Advertising Expense	−0.058	−0.042	−0.06	−0.095*	−0.055
	(0.043)	(0.046)	(0.043)	(0.055)	(0.043)
Stock Return	−0.056***	−0.051***	−0.057***	−0.067***	−0.056***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Regulated	0.103***	0.108***	0.102***	0.104***	0.102***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
GDP Growth	0.035	0.053	0.077***	−0.149***	0.095***
	(0.029)	(0.039)	(0.03)	(0.029)	(0.03)
Corp Profit Growth	−0.019***	−0.007	−0.019***	0.015***	−0.007**
	(0.004)	(0.006)	(0.004)	(0.004)	(0.003)
Market Return	−0.066***	−0.058***	−0.069***	−0.05***	−0.053***
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
N	73,034	56,176	73,034	50,914	73,034
Model F	544.5	505.5	508.8	514.1	521.3
p-value	0.00	0.00	0.00	0.00	0.00

market access indicator and the credit condition proxies are positive and significant for the lending standards index and the monetary policy indicators, and negative and significant for the bank debt mix. This suggests that the magnitude of the leverage difference between firms with and without public debt market access is greater in periods of tight credit conditions/reduced loan supply and dampened in periods of looser credit. Results are robust to allowing the coefficients on the independent variables to vary across groups. Similar results are also obtained for book leverage.

The effect is also of reasonable economic magnitude. For example, the lending standards, bank debt mix, and Fed Funds spread proxies are standardized, suggesting that a one-standard deviation move in these measures increases the leverage difference between the groups by about one to one-and-a-half percentage points. This change represents about one-third to one-half the average leverage difference of 2.8 percentage points estimated in column (1). Thus, while these proxies may arguably be weaker proxies for loan supply than the loan supply shifts studied above, the evidence suggests that the link between loan supply and firm financing choice extends to a broader sample and longer time period.

Given the changes over time in how the lending standards survey was designed, I have also estimated the equation using this proxy separately for different subperiods. The first is the period from 1967 through 1977 in which the survey used a consistent set of questions and sample banks with the broadest coverage (see Schreft and Owens (1991)). The second is the period after 1990, when the questions on business lending standards were reintroduced following a 6-year gap. The results (unreported) show that the sign and significance of the coefficient on the interaction between the bond market access indicator and the lending standards is the same in both subsamples as in the larger sample, though the magnitude is lower in the later period.

VI. Conclusion and Areas for Future Research

This paper studies the impact of shifts in the availability of bank loans on the capital structures of firms with and without access to public debt markets. Using two changes in bank funding constraints, I show that following expansions (contractions) in the availability of bank loans, leverage ratios of bank-dependent firms significantly increase (decrease) relative to firms with public market access. Consistent with the role of supply factors, these leverage changes are associated with constrained access to bank debt and a greater reliance on equity financing by small firms in periods of tight credit, as well as substitution from private to public debt by large firms.

These results suggest that the market frictions that generate debt market segmentation are, in fact, relevant for capital structure choice. Thus, differences in market access may contribute to the unexplained persistent fixed effect in leverage documented in the recent study by Lemmon et al. (2008). In addition, the differential effects of variation in the availability of certain types of credit

(e.g., bank loans) may help account for some of the previously unexplained heterogeneity in capital structures (Welch (2004)). As a byproduct, the analysis also suggests that firm size is an important determinant of capital structure, at least in part, because it proxies for differences in bank dependence and bond market access.

These findings also suggest that credit supply conditions may have an important impact on other corporate financial decisions. For example, survey evidence by Graham and Harvey (2001) and recent empirical findings by Barry et al. (2008) suggest that managers routinely time debt issuances to periods when interest rates are low relative to recent historical rates. This behavior seems opposite to the experience of the late 1960s, however, as described by the *Investment Dealers' Digest* in 1970 (emphasis added):

> Most of this increase in [public] debt [in 1967] can be accounted for by the liquidity crisis of the previous year as well as anticipation of another tight money situation in the year ahead. The availability factor was obviously the major reason why so many companies went ahead with debt financing during 1967, *despite a market place which commanded the highest interest costs since the post Civil War period* (p. 20).

This suggests that while "backward-oriented" debt market timing may be common, it does not always offer a good description of how firms choose the timing of their debt issues, particularly in the presence of credit supply shocks.

My findings also have implications for how we study the relationship between interest rates and the choice of debt source. For example, Diamond (1991) predicts that the ratio of bank to nonbank debt should be positively related to interest rates. As Stein (1998) discusses, however, when interest rate movements are associated with changes in the availability of bank loans (i.e., credit crunches or monetary shocks), one would expect the opposite. Cantillo and Wright (2000) present firm-level evidence consistent with Diamond's prediction. Data from the time period studied here shows evidence consistent with both predictions. Specifically, the ratio of bank to nonbank debt for small firms, relative to that of large firms, is positively correlated with interest rates over the sample period as a whole (correlation coefficient of 0.38). However, for events such as the Credit Crunch of 1966 and the subsequent crunch in 1969, when interest rate increases accompany shocks to loan supply, the ratio of bank to nonbank debt falls for small firms relative to large firms (correlation coefficients of -0.67 and -0.68 in those years, respectively). This suggests that in order to fully understand the relation between interest rates and debt source, we need to consider both the macroeconomic environment as well as the differential effects on bank dependent and nondependent firms.

Appendix

This appendix provides definitions for the variables used throughout the paper.

CD Period	An indicator equal to one after the emergence of the negotiable CD market in 1961 and zero before.
Crunch	Indicator variable equal to one during the 1966 Credit Crunch (1966 when using annual data, 1966:Q2 to 1966:Q3 when using quarterly data) and zero otherwise.
Post Crunch	Indicator variable equal to one after the 1966 Credit Crunch and zero otherwise.
No Access	For the Firm Size (Pr(Rated)) columns, an indicator variable equal to one and zero, respectively, for firms in the two lowest and two highest deciles of book assets (predicted probability of a bond rating) at the year-end just prior to each supply shock. The probability of bond market access is defined as the fitted values from a probit model of the existence of a bond rating as in Faulkender and Petersen (2006).
Firm Size	Natural logarithm of the book value of assets.
Profitability	Operating income divided by sales.
Tangibility	Net property plant and equipment scaled by the book value of assets.
MA/BA	The ratio of the market value to the book value of assets, where market value of assets is defined as book assets minus book equity plus the market value of equity.
Book Leverage	The ratio of total (short-term plus long-term) book value of debt to book value of assets.
Market Leverage	The ratio of total (short-term plus long-term) book value of debt to the sum of the book value of debt and market value of equity (share price times shares outstanding).
Earnings Volatility	The standard deviation of operating earnings scaled by book assets over the trailing 12 quarters.
GDP Growth	Four-quarter growth rate of real GDP.
Corp Profit Growth	Four-quarter growth rate of aggregate domestic nonfinancial corporate profits from the Flow of Funds Accounts.
Market Return	The 1-year growth rate of the S&P 500 index.
Default Spread	The average yield on Aaa-rated corporate bonds minus that on Baa-rated.
Term Spread	The difference between 20-year and 3-month constant maturity Treasury yields.
Standards	The annual average of the net percentage of loan officers reporting tighter credit standards for commercial and industrial loans over the previous quarter, taken from the Federal Reserve Board's Senior Loan Officer Opinion Survey on Bank Lending Practices.
Bank Mix	The change in the ratio of bank loans to the sum of bank loans, commercial paper, and corporate bonds outstanding, taken from the Federal Reserve's quarterly Flow of Funds Accounts.
Romer	An indicator variable equal to one if a Romer date, as defined in Romer and Romer (1993), occurred in the previous year.
FedFund Spread	The spread between the Federal Funds rate and the rate on 10-year constant maturity Treasury bonds.
Firm Age	The number of years since the firm first appeared in the Compustat database.
R&D/Sales	The ratio of research and development expense to sales.
Advertising/Sales	The ratio of advertising expense to sales.
Stock return	The 1-year firm-specific equity return.
Regulated	An indicator equal to one for firms in regulated utilities industries (SIC 4900-4949) and zero otherwise.

REFERENCES

Barry, Christopher B., Steven C. Mann, Vassil Mihov and Mauricio Rodriguez, 2008, Corporate debt issuance and the historical level of interest rates, *Financial Management* 37, 413–430.

Bernanke, Ben S., and Alan S. Blinder, 1988, Credit, money and aggregate demand, *American Economic Review* 78, 435–439.

Bernanke, Ben S., and Alan S. Blinder, 1992, The federal funds rate and the channels of monetary transmission, *American Economic Review* 82, 901–921.

Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan, 2004, How much should we trust difference-in-differences estimates? *Quarterly Journal of Economics* 119, 249–275.

Brealey, Richard A., and Stewart C. Myers, 1996, *Principles of Corporate Finance* (McGraw-Hill, New York, NY).

Budzeika, George, 1971, *Lending to Business by New York City Banks* (Institute of Finance, New York University, New York).

Burger, Albert E., 1969, A historical analysis of the credit crunch of 1966, Federal Reserve Bank of St. Louis *Review* 51, September, 13–30.

Calomiris, Charles W., Charles P. Himmelberg, and Paul Wachtel, 1995, Commercial paper, corporate finance and the business cycle: A microeconomic perspective, *Carnegie-Rochester Conference Series on Public Policy* 42, 203–250.

Cantillo, Miguel, and Julian Wright, 2000, How do firms choose their lenders? An empirical investigation, *Review of Financial Studies* 13, 155–189.

Cleveland, Harold van B., and Thomas F. Huertas, 1985, *Citibank, 1812–1970* (Harvard University Press, Cambridge, MA).

Denis, David J., and Vassil T. Mihov, 2003, The choice among bank debt, non-bank private debt and public debt: Evidence from new corporate borrowings, *Journal of Financial Economics* 70, 3–28.

Diamond, Douglas, 1984, Financial intermediation and delegated monitoring, *Review of Economic Studies* 51, 393–414.

Diamond, Douglas, 1991, Monitoring and reputation: The choice between bank loans and directly placed debt, *Journal of Political Economy* 99, 689–721.

Fama, Eugene F., 1985, What's different about banks? *Journal of Monetary Economics* 15, 29–37.

Fama, Eugene F., and Kenneth R. French, 2005, Financing decisions: Who issues stock? *Journal of Financial Economics* 76, 549–582.

Faulkender, Michael, and Mitchell A. Petersen, 2006, Does the source of capital affect capital structure? *Review of Financial Studies* 19, 45–79.

Fazzari, Steven M., R. Glenn Hubbard, and Bruce C. Petersen, 1988, Financing constraints and corporate investment, *Brookings Papers on Economic Activity* 1, 141–195.

Federal Reserve Bank of New York, 1966, *Monthly Review* 48.

Fischer, Edwin O., Robert Heinkel, and Josef Zechner, 1989, Dynamic capital structure choice: Theory and tests, *Journal of Finance* 44, 19–40.

Fortune, 1968, That epic corporate bond binge, February, 121–184.

Frank, Murray, and Vidhan Goyal, 2004, Capital structure decisions: Which factors are reliably important? Working paper, University of British Columbia.

Friedman, Benjamin M., 1975, Regulation Q and the commercial loan market in the 1960s, *Journal of Money, Credit, and Banking* 7, 277–296.

Gertler, Mark, and Simon Gilchrist, 1994, Monetary policy, business cycles, and the behavior of small manufacturing firms, *Quarterly Journal of Economics* 109, 309–340.

Graham, John R., and Campbell R. Harvey, 2001, The theory and practice of corporate finance: Evidence from the field, *Journal of Financial Economics* 60, 187–243.

Graham, John R., and Krishna Narasimhan, 2004, Corporate survival and managerial experiences during the Great Depression, Working paper, Duke University.

Hancock, Diana, and James A. Wilcox, 1998, The "credit crunch" and the availability of credit to small businesses, *Journal of Banking and Finance* 22, 983–1014.

Heebner, A. Gilbert, 1969, *Negotiable Certificates of Deposit: The Development of a Money Market Instrument*, (Institute of Finance, New York University, New York).

Heinemann, H. Erich, 1966a, Further squeeze on credit looms, *New York Times*, May 20, 65.
Heinemann, H. Erich, 1966b, Bankers predict interest rates will rise anew, *New York Times*, August 21, 127.
Hillstrom, Roger, and Robert King, 1972, *1960–1969, A Decade of Corporate and International Finance* (Investment Dealers' Digest, New York).
Holmstrom, Bengt, and Jean Tirole, 1997, Financial intermediation, loanable funds, and the real sector, *Quarterly Journal of Economics* 112, 663–691.
Hoshi, Takeo, Anil K. Kashyap, and David S. Scharfstein, 1993, The choice between public and private debt: An analysis of post-deregulation corporate financing in Japan, NBER Working paper 4421, Harvard University.
Hovakimian, Armen, Tim Opler, and Sheridan Titman, 2001, The debt-equity choice, *Journal of Financial and Quantitative Analysis* 36, 1–24.
Jaffee, Dwight M., and Thomas Russell, 1976, Imperfect information, uncertainty and credit rationing, *Quarterly Journal of Economics* 90, 651–666.
James, Chris, 1987, Some evidence on the uniqueness of bank loans, *Journal of Financial Economics* 19, 217–236.
Johnson, Shane A., 1997, An empirical analysis of the determinants of corporate debt ownership structure, *Journal of Financial and Quantitative Analysis* 32, 47–69.
Kashyap, Anil K., Owen A. Lamont, and Jeremy C. Stein, 1994, Credit conditions and the cyclical behavior of inventories, *Quarterly Journal of Economics* 109, 565–592.
Kashyap, Anil K., and Jeremy C. Stein, 2000, What do a million observations on banks say about the transmission of monetary policy? *American Economic Review* 90, 407–428.
Kashyap, Anil K., Jeremy C. Stein, and David W. Wilcox, 1993, Monetary policy and credit conditions: Evidence from the composition of external finance, *American Economic Review* 83, 78–96.
Korajczyk, Robert A., and Amnon Levy, 2003, Capital structure choice: Macroeconomic conditions and financial constraints, *Journal of Financial Economics* 68, 75–109.
Kraus, Albert L., 1961a, Interest on time deposits paid by the First National City Bank, *New York Times*, February 12, 49, 58.
Kraus, Albert L., 1961b, Banks must pay to lure deposits, *New York Times*, February 26, F1.
Krishnaswami, Sudha, Paul A. Spindt, and Venkat Subramaniam, 1999, Information assymetry, monitoring and the placement structure of corporate debt, *Journal of Financial Economics* 51, 407–434.
Kurshev, Alexander, and Ilya Strebulaev, 2006, Firm size and capital structure, Working paper, Stanford University.
Leary, Mark T., and Michael R. Roberts, 2005, Do firms rebalance their capital structures? *Journal of Finance* 60, 2575–2620.
Lemmon, Michael L., and Michael R. Roberts, 2007, The response of corporate financing and investment to changes in the supply of credit, forthcoming, *Journal of Financial and Quantitative Analysis*.
Lemmon, Michael L., Michael R. Roberts, and Jaime F. Zender, 2008, Back to the beginning: Persistence and the cross-section of corporate capital structure, *Journal of Finance* 63, 1575–1608.
Lown, Cara, and D. P. Morgan, 2006, The credit cycle and the business cycle: New findings using the loan officer opinion survey, *Journal of Money, Credit, and Banking* 38, 1575–1597.
Meyer, Bruce D., 1995, Natural and quasi-experiments in economics, *Journal of Business and Economic Statistics* 13, 151–161.
Mishkin, Fredric S., 2003, The Economics of Money, Banking, and Financial Markets, 6th ed. (Addison Wesley, Boston, MA).
Modigliani, Franco, and Merton Miller, 1958, The cost of capital, corporation finance and the theory of investment, *American Economic Review* 48, 261–297.
Morris, Marc D., and John R. Walter, 1993, Large negotiable certificates of deposit, in *Instruments of the Money Market*, 7th ed. (Federal Reserve Bank of Richmond, Richmond, VA).
Nadler, Marcus, and Joseph H. Taggart, 1963a, *New Forces in the Money and Capital Markets* (C.J. Devine Institute of Finance, New York University, New York).

Nadler, Marcus, and Joseph H. Taggart, 1963b, *The Commercial Banks in a Changing World* (C.J. Devine Institute of Finance, New York University, New York).

Nadler, Paul S., 1964, *Time Deposits and Debentures: The New Sources of Bank Funds* (C.J. Devine Institute of Finance, New York University, New York).

Oliner, Stephen D., and Glenn D. Rudebusch, 1996, Monetary policy and credit conditions: Evidence from the composition of external finance: Comment, *American Economic Review* 86, 300–309.

Owens, Raymond E., and Stacey L. Schreft, 1995, Identifying credit crunches, *Contemporary Economic Policy* 13, 63–76.

Rajan, Raghuram G., 1992, Insiders and outsiders: The choice between informed and arm's length debt, *Journal of Finance* 47, 1367–1400.

Rajan, Raghuram G., and Luigi Zingales, 1995, What do we know about capital structure: Some evidence from international data, *Journal of Finance* 50, 1421–1460.

Reierson, Roy L., 1962, New forces in the money market, *Journal of Finance* 17, 220–229.

Romer, Christina D., and David H. Romer, 1990, New evidence on the monetary transmission mechanism, *Brookings Papers on Economic Activity* 1, 149–214.

Roussakis, Emmanuel N., 1997, *Commercial Banking in an Era of Deregulation*, 3rd ed., (Praeger, Westport, CT).

Schreft, Stacey L., and Raymond E. Owens, 1991, Survey evidence of tighter credit conditions: What does it mean? Federal Reserve Bank of Richmond *Economic Review* 77, 29–34.

Stafford, Erik, 2001, Managing financial policy: Evidence from the financing of major investments, Working paper, Harvard University.

Stiglitz, Joseph E., and Andrew Weiss, 1981, Credit rationing in markets with imperfect information, *American Economic Review* 71, 393–410.

Stein, Jeremy C., 1998, An adverse-selection model of bank asset and liability management with implications for the transmission of monetary policy, *RAND Journal of Economics* 29, 466–486.

Titman, Sheridan, 2002, The Modigliani and Miller theorem and the integration of financial markets, *Financial Management* 31, 101–115.

Welch, Ivo, 2004, Capital structure and stock returns, *Journal of Political Economy* 112, 106–131.

Wojnilower, Albert M., 1980, The central role of credit crunches in recent financial history, *Brookings Papers on Economic Activity* 2, 277–339.