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Author(s): Joel Houston and Christopher James

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Bank Information Monopolies and the Mix of Private and Public Debt Claims

JOEL HOUSTON and CHRISTOPHER JAMES*

ABSTRACT

This article examines the determinants of the mix of private and public debt using detailed information on the debt structure of 250 publicly traded corporations from 1980 through 1990. We find that the relationship between bank borrowing and the importance of growth opportunities depends on the number of banks the firm uses and whether the firm has public debt outstanding. For firms with a single bank relationship, the reliance on bank debt is negatively related to the importance of growth opportunities. In contrast, among firms borrowing from multiple banks, the relationship is positive.

DESPITE THE IMPORTANCE OF BANKS and other private lenders as a source of funds to U.S. corporations, the determinants of the choice between public and private debt financing for large corporations are not well understood.¹ Theoretical studies on the role of banks (and other private lenders) in the corporate capital acquisition process focus on information production and control functions of private lenders (see for example Diamond (1984, 1991), Fama (1985), and Berlin and Loeys (1988)). By mitigating adverse selection and moral hazard problems and by providing flexibility through recontracting, bank financing can be less expensive than borrowing from public (arm's length) lenders.

While monitoring costs and bank regulatory taxes can potentially offset these benefits of bank financing, there is little theoretical work on the determinants of the optimal mix of private and public debt. An important exception is recent work by Diamond (1993) and Rajan (1992), which examines how a mix of private (inside debt) and public (arm's length) debt can improve investment decisions and increase overall firm value. In the context of these models, the

* Graduate School of Business Administration, University of Florida, Gainesville. Thanks to David Marcus and Ebru Tan for research assistance. Thanks to John Boyd, David Brown, Mark Flannery, Glenn Hubbard, Mitch Petersen, René Stulz, an anonymous referee, workshop participants at The Federal Reserve Board of Governors, Michigan State University, University of Michigan, Northwestern University, participants in the conference on designing Banking Systems in Milan, Italy, and the JFI symposium for helpful comments.

¹ Private borrowing (primarily from commercial banks) is the largest source of external financing for nonfinancial firms in the United States as well as in Western Europe and Japan (see Mayer (1988)). However, there is an active debate concerning changes in the role of banks in corporate financing. Specifically, while the commercial banks' share of financial sector assets and business debt financing has declined since 1970, Boyd and Gertler (1994) and Kaufman and Mote (1994) argue that these measures overstate the decline in the banking sector. Any decline in banking is likely to be overstated by these measures because of the growth of "off-balance" sheet activities and the increased use of debt financing.

control that bank lenders exert over the firm's investment decisions represents both the primary cost and benefit of bank financing. For example, Rajan argues that while bank monitoring and control can improve investment decisions, a single bank lender may obtain an information monopoly that adversely affects investment incentives. Borrowing from public markets limits bank bargaining power and can improve investment efficiency. Alternatively, as Diamond argues, a mix of public and private debt can improve investment incentives by limiting bank control over liquidation decisions.

Past empirical studies focus primarily on the benefits of bank relationships (see, for example, James (1987), Lummer and McConnell (1989), and Hoshi, Kashyap, and Scharfstein (1993)), and not on the determinants of the mix of public and private debt claims. In this article, we empirically examine the importance of bank information monopolies in determining a firm's reliance on bank debt. To examine this issue, we have collected detailed information on the debt structure for 250 randomly selected New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and National Association of Securities Dealers (NASD) traded companies at three points in time: 1980, 1985, and 1990. Information on the debt structure for these companies is obtained from the companies' annual reports and 10K filings and is supplemented with financial data from COMPUSTAT. This level of detail enables us to examine the pattern of corporate debt financing cross-sectionally as well as changes in the mix of debt financing over this time period.

We focus on the debt structure of large publicly traded firms for several reasons. First, if there are economies of scale in public debt issuances, large publicly traded firms are most likely to find public debt offers feasible. As a result, these firms are most likely to confront the choice between issuing public and private debt. Second, to the extent that regulatory taxes or innovations in public debt markets have eroded bank market shares, this erosion is likely to be the greatest among the large publicly traded firms in our sample. Finally, while previous empirical studies provide direct evidence on the benefits of lending relationships for small firms (see, for example, Petersen and Rajan (1994)), there is little direct evidence on the benefits of bank lending relationships or the implications of these relationships for the capital structure of large publicly traded firms.

We find that reliance on bank borrowing depends on firm size, the importance of growth opportunities and intangible assets, overall leverage, the number of bank relationships, and the firm's access to public debt markets. In particular, we find that reliance on bank borrowing is decreasing in firm size and overall leverage. These results suggest that the banks specialize in lending to smaller, less risky firms. We also find that the relationship between bank borrowing and the importance of growth opportunities depends on the firm's use of multiple banking relationships and public debt.

Surprisingly, for firms with a single bank relationship, we find a negative and statistically significant relation between the reliance on bank debt and the importance of growth options. This finding is inconsistent with the hypothesis that firms with larger information asymmetries or greater agency problems of

debt rely more on bank financing. This finding, however, is consistent with the argument that potential hold-up problems associated with borrowing from a single bank limit a firm's reliance on bank borrowing. Thus, while bank relationships have potential benefits in terms of reducing information problems, our results suggest that bank information monopolies impose offsetting costs even for the largest corporations.

In contrast to the results for firms with a single bank lender, among firms with multiple banking relations, we find a positive relation between the reliance on bank debt and the importance of growth opportunities. One interpretation of this result is that multiple banking relationships mitigate potential bank information monopolies. As Rajan (1992) points out, using public or "arm's length" debt may also mitigate bank information monopolies. Consistent with this view, we find that among firms with public debt outstanding, the reliance on bank debt is positively related to the importance of growth opportunities. An alternative explanation is that information asymmetries are less severe for firms that borrow from multiple lenders and/or in public debt markets and as a result, for these firms, bank information monopolies are less important. Both explanations are consistent with information monopolies limiting the use of bank debt.

Unlike multiple banking relationships or public debt, multiple nonbank private debt relationships do not appear to mitigate information monopolies. In particular, for firms with a single bank relationship but other private debt outstanding, we find a negative relationship between the reliance on bank debt and the importance of growth opportunities. These results suggest that other private debt does not resolve potential bank hold-up problems, implying that bank debt provides a role which is distinct or "unique" from that of other private debt.²

The remainder of the article is organized as follows. Section I provides a brief review of the theoretical work on the determinants of the choice of private versus public debt and serves to motivate our empirical analysis. Section II describes our sample selection procedure. Section III provides descriptive statistics concerning the reliance on bank and public borrowing by the firms in our sample. In Section IV, we provide our empirical results concerning the determinants of bank borrowing. We also examine changes in the reliance on bank borrowing over time. We present our conclusions in Section V.

I. Factors Affecting Corporate Reliance on Bank Financing

Models of the choice between public and private debt claims focus on two key differences between public and private debt. First, public debt is generally diffusely held, while the ownership of private debt is concentrated in a few

² Banking's uniqueness may result from comparative cost advantages that may arise from synergies in deposit taking and lending. For empirical support for this proposition, see James (1987) and Lummer and McConnell (1989). Recent work by Preece and Mullineaux (1994) provides conflicting evidence concerning the uniqueness of bank loans.

lenders. Second, restructurings of public debt are governed by the Trust Indenture Act of 1939, which makes the modification of public debt contracts more difficult than private debt contracts.³

A number of authors (see Smith and Warner (1979), Blackwell and Kidwell (1988), Diamond (1984, 1991), and Berlin and Loeys (1988)) argue that these differences imply that, *ceteris paribus*, public debt has higher agency costs relative to private debt. For example, the diffuse ownership of public debt reduces the incentives individual bondholders have to engage in costly information production and monitoring. Monitoring by a large number of bondholders is also inefficient, since it involves needless duplication of monitoring costs. In contrast, the concentrated ownership of private debt claims serves to reduce free rider problems and increase overall information production and monitoring. Greater information production and monitoring by private lenders and the flexibility they have to restructure private debt claims also increase the control private lenders exert over the investment (and liquidation) decisions of the borrower. Better *ex-ante* information and increased creditor control, in turn, reduce adverse selection and moral hazard problems associated with external financing (see Diamond (1984), Boyd and Prescott (1986), and Berlin and Loeys (1988)).

While the benefits of private borrowing apply to both bank and nonbank private lenders, it is frequently argued that banks have a comparative advantage *vis à vis* other private lenders in monitoring borrowers (see, for example, Fama (1985)). As a result, bank lending is especially important in overcoming adverse selection and moral hazard problems. In our empirical analysis, we distinguish between bank loans and nonbank private borrowing.

Given the benefits of private lender monitoring and control, without some offsetting costs, firms would prefer to borrow exclusively from private lenders. Monitoring costs, bank regulatory taxes, and agency costs of delegated monitoring are potentially offsetting costs associated with the use of private debt (see Berlin and Loeys (1988) and Diamond (1991)). Incorporating these costs suggests that a firm's reliance on bank debt will depend on the potential information asymmetries between borrowers and lenders, as well as the agency costs of debt financing. Where information asymmetries and agency costs of debt are large, the benefits of private borrowing are likely to be large relative to the potential costs of private lender monitoring (see for example Smith and Warner (1979)). For example, smaller firms and firms with a higher proportion of intangible assets (and presumably more difficult to value assets) are expected to rely primarily on bank financing.⁴ In addition, to the extent that the agency problems of debt financing are more severe among firms with greater growth opportunities, one would expect a positive relation between the

³ The Trust Indenture Act prohibits the modifications of key provisions of the bond contract without the consent of each bondholder. See Smith and Warner (1979) for a discussion of the Trust Indenture Act. Gertner and Scharfstein (1991) provide a discussion of the implications of the Trust Indenture Act for public debt restructurings in financial distress.

⁴ Barclay and Smith (1995) make a similar argument concerning a firm's reliance on short-term (primarily bank) borrowing.

reliance on bank debt financing and the proportion of the firm's value arising from growth opportunities.⁵

An alternative approach to explaining the mix of private and public debt is based on the observation that while greater lender control over the actions of the borrower mitigates agency problems, control by private lenders can adversely affect investment incentives. For example, Diamond (1993) argues that relying exclusively on short-term private debt can be costly because borrower control rights are not considered by the lender when determining whether to roll over a loan or call the loan and force liquidation. By borrowing from both public and private sources, borrowers reduce the private lender's control and thereby reduce costly liquidations.

Rajan (1992) and Sharpe (1990) discuss another cost of relying exclusively on private debt. In these models, information acquired by a bank or other private lender as part of an ongoing relationship can create an "information monopoly" or hold-up problems in that it is costly for the borrower to switch lenders. Rajan (1992) argues that while competition ensures that the rents banks are expected to extract ex-post are reflected ex-ante in lower loan rates, the expropriation of these rents distorts the firm's investment decisions by limiting the entrepreneur's gains from successful projects. Borrowing from "arm's length" public lenders limits the rents the bank can expropriate and therefore can improve investment efficiency.⁶

In this article, we focus on the importance of potential hold-up problems in determining the mix of public and private debt claims. As Hooks and Opler (1993) point out, hold-up problems associated with borrowing from a single bank lender are likely to be particularly acute for firms with substantial growth opportunities and firms with substantial intangible assets (i.e., firms with high market to book ratios and substantial expenditures on R&D). As a result, it is expected that these firms are less likely to rely on a single bank lender.

While the use of public debt can mitigate a single bank's information monopoly, another alternative is borrowing from several banks. As discussed in Rajan (1992), assuming Bertrand competition and equal monitoring costs, multiple banking relationships resolve the hold-up problem. If this is the case, one would expect, among firms that borrow from multiple banks, a positive

⁵ Recent work by Diamond (1991) and Hoshi, Kashyap, and Scharfstein (1993) suggests that the demand for monitoring and hence the reliance on bank borrowing depends on the firm's growth opportunities as well as the credit quality of the firm. In the context of Diamond's model, older successful firms with reputational capital at stake will rely more on public debt financing, while younger firms and older, less successful firms will rely on bank borrowing. Hoshi, Kashyap, and Scharfstein's model yields similar predictions. Specifically, reliance on bank financing depends on the firm's investment opportunities as well as the investment incentives of the firm's managers. Managers of firms may select public debt financing either because the need for monitoring is low (i.e., firms with high net worth and profitable investment opportunities) or as a way of insulating themselves from monitoring (i.e., firms with low net worth and low Tobin's Q).

⁶ Work by Diamond (1993) and Rajan and Winton (1995) suggests that the mix of private and public debt, as well as the maturity and seniority structure of the firm's debt claims, is also important in determining the bank monitoring activity and the agency costs of debt financing.

relationship between the reliance on bank loans and the firm's growth opportunities.

If monitoring is discretionary and costly, then the effectiveness of multiple banking relationships in resolving hold-up problems is reduced. For example, if one bank has easier access to information about the borrower (i.e., lower monitoring costs), it may be able to preempt monitoring by other banks and, therefore, establish an information monopoly (albeit smaller). Moreover, even with equal monitoring costs, free rider problems or duplication of monitoring costs can reduce the efficiency of multiple banking relations. Consequently, some (presumably smaller) firms may decide not to enter into multiple banking relationships.

Even if multiple banks collude, hold-up problems may be less severe for firms with multiple lenders. In particular, firms with multiple lenders or firms that borrow in public markets may face less severe information asymmetries (due perhaps to size-based economies in information production or disclosure requirements). As a result, the cost of switching lenders is lower for these firms, and the bank's (or group of banks') information monopoly is reduced. The effectiveness of multiple banking relationships in reducing hold-up problems is therefore an empirical issue.

In the empirical analysis, we measure the importance of growth opportunities and intangible assets by the market to book value of the firm's assets and by the ratio of R&D to sales.⁷ In the absence of bank information monopolies, a positive relationship is expected between these measures of growth opportunities and the reliance on bank debt. By contrast, the existence of information monopolies suggests that the rents banks can extract will be increasing in the value of the firm's growth opportunities. As a result, the adverse incentive effects of relying on bank debt are likely to be greatest for these firms. This argument suggests that hold-up problems can cause a negative relationship between the importance of growth opportunities and the reliance on bank debt. If hold-up problems are less severe for firms that employ multiple bank lenders or use public debt, the relation between our measures of growth opportunities and reliance on bank debt is expected to be less negative (or perhaps even positive) for these firms.

While we focus our empirical analysis on the importance of hold-up problems in determining the mix of private and public debt, we control for other factors that may affect a firm's reliance on private borrowing. For example, the use of private debt is likely to be related to firm size. There are two reasons to expect a negative relation. First, information asymmetries are likely to be lower for larger firms than for smaller firms which lowers the demand for the monitoring services of private lenders. Second, as Blackwell and Kidwell (1988) suggest, economies of scale in the issuance of public debt make it more likely that larger firms will rely on public debt.

⁷ These are widely used proxies for the importance of growth opportunities. See for example Smith and Watts (1992) or Hoshi, Kashyap, and Scharfstein (1993). As discussed below, we examine whether our results are sensitive to the measure of growth opportunities used.

Recent work by Diamond (1991) and Hoshi, Kashyap, and Scharfstein (1993) suggests that reliance on private borrowing also is related to the credit quality (default risk) and reputational capital of the borrower. High net worth firms or firms with extensive track records find bank monitoring unnecessary because these firms have more to lose from poor investment decisions. From a different perspective, Blackwell and Kidwell (1988) argue that more credit-worthy firms will rely more heavily on public debt financing. In their model, private debt has lower agency costs but potentially higher transaction costs (given the large economies of scale in issuing public debt). Firms issue public claims where the lower transaction costs of public debt offset the higher agency costs of public debt financing. This will occur at a lower offer size for higher quality firms, which have lower agency costs regardless of the source of financing.

Theoretical models of the choice between public and private debt generally ignore outside equity. Nevertheless, a firm's reliance on bank debt may be correlated with the total amount of debt financing used. In particular, earlier research focusing on the complementary nature of bank debt and public debt (e.g., Gorton and Haubrich (1987) and Fama (1985)) suggests that bank monitoring creates a public good that reduces the cost of issuing public debt. Lower costs of public debt financing may lead in turn to greater use of leverage. Alternatively, if bank debt is senior to public debt, the bank's incentives to monitor on behalf of junior creditors may be reduced once firms rely more heavily on public debt. Indeed, Diamond (1993) suggests that higher levered firms may choose to limit the amount of bank debt in order to avoid having the firm liquidated too frequently.

II. Data

We empirically examine the mix of private and public debt using a sample of 250 firms randomly selected from a list of companies for which there were COMPUSTAT and CRSP (both the NYSE/AMEX and NASD tapes) data available for fiscal year 1980.⁸ Since our primary concern is with the factors influencing the mix of private and public debt claims, the 250 firms are selected from a subset of COMPUSTAT and CRSP-listed firms that had long-term debt outstanding in 1980. For each firm in our sample, COMPUSTAT provides income and balance sheet information. CRSP data are used to calculate the market value of each firm at the end of the fiscal year.

The bulk of our data set consists of detailed information regarding the debt structure of each firm. This information is collected from the firm's annual reports and Securities and Exchange Commission (SEC) 10K filings (primarily from the notes to the financial statements). The information collected includes: the source of debt (whether it is bank debt, commercial paper, public debt, or other private debt), the maturity of each debt issue, whether or not the debt is secured, the number of bank relationships the firm maintains, the number of

⁸ We exclude from our sample financial institutions (banks and insurance companies) as well as regulated utilities.

public debt issues, the number of priority classes of public debt, and available lines of credit. To our knowledge, our data base is the first to provide detailed information on the debt structure of publicly traded firms.

In many cases, the annual report indicates whether the debt is publicly or privately held but does not identify the lender (i.e., whether or not the lender is a commercial bank). We define bank borrowing broadly to include borrowing referred to as “bank” borrowing as well as private borrowing where the identity of the lender is not provided. We define other nonbank private borrowing as private debt, where the lender is identified as a nonbank lender (e.g., insurance companies, finance companies, and pension funds). As a result, our measure of bank borrowing is likely to overstate the amount of borrowing from commercial banks.⁹

Bank debt is classified according to whether it is term debt (original maturity of five years or more) or short-term notes payable. We further divide short-term notes according to whether or not the loan is part of a short-term line of credit or revolving credit agreement. Since borrowing under lines of credit and revolving credits is generally referred to in the financial reports as bank borrowing, this category of borrowing is least likely to be provided by sources other than commercial banks.

A firm is assumed to have multiple banking relationships if the annual report or 10K indicates borrowing from multiple banks. In many cases we were unable to determine if the firm had more than one bank lender. Rather than classifying these firms as having either a single or multiple banking relationship, we have chosen in our empirical analysis to assign a missing value to these observations.

In order to trace changes in the reliance on bank financing, we also collect information on the debt structure for each firm for fiscal year 1985 and fiscal year 1990. Over time, firms drop out of the sample, leaving us with 193 firms for 1985 and 161 firms for 1990. We obtain information on the reasons firms left our sample from two sources. First, CRSP provides the date a firm is delisted and the reason for the delisting. Second, for firms that are delisted, we conduct a Dow Jones News Retrieval search for the 6 months prior to and 6 months following the delist date. Using this procedure, we are able to determine the reason for why all but 10 of the firms left our sample. The primary reasons that firms leave the sample are: acquisition, delisting because of financial distress, and going-private transaction.

III. Descriptive Statistics on the Pattern of Corporate Borrowing

Table I provides summary statistics regarding the financial characteristics of the firms in our sample. Since summary statistics may change over time

⁹ A similar problem arises when determining whether private debt claims are secured. In particular, approximately half of the annual reports did not indicate whether the bank borrowing was secured. In the analysis that follows, we assume that if the borrowing is not reported as secured, it is unsecured borrowing.

Table I
Descriptive Statistics Concerning Financial Characteristics and Debt Structure

The sample consists of observations from 1980, 1985, and 1990 for 250 randomly selected exchange and National Association of Securities Dealers (NASD) traded firms with long term debt outstanding in 1980. Financial information is from COMPUSTAT, 10K filings, and annual reports. Leverage is measured as short plus long term debt divided by total assets. The market to book ratio is the book value of liabilities and preferred stock plus the market value of common stock divided by the book value of assets. Bank debt is from the firm's annual report or 10K filing. Total debt equals short plus long term debt less industrial revenue bonds, mortgages, and capitalized leases. Other private debt is privately placed bonds and loans specified in the financial statements as being from nonbank sources.

	Overall		1980		1985		1990	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Assets (millions)	1502	112	906	82	1430	115	2666	225.1
Leverage	0.39	0.35	0.36	0.35	0.39	0.33	0.45	0.40
Coverage ratio	11.21	3.34	10.71	3.94	14.96	3.4	6.91	2.32
Market/book	1.38	1.08	1.30	1.01	1.32	1.17	1.62	1.07
Bank debt/total debt	0.64	0.77	0.66	0.82	0.66	0.80	0.59	0.69
Public debt/total debt	0.15	0.00	0.13	0.00	0.16	0.00	0.17	0.00
Commercial paper/total debt	0.02	0.00	0.01	0.00	0.02	0.00	0.03	0.00
Other private/total debt	0.13	0.01	0.16	0.01	0.11	0.00	0.11	0.01
Unused lines of credit/total bank debt	2.66	0.48	2.39	0.44	2.40	0.60	3.60	0.46
Unused lines of credit/assets	0.13	0.07	0.13	0.05	0.12	0.09	0.13	0.08
Percent with multiple banking relationships	66		59		73		68	
Percent with secured bank debt	31		31		28		34	
Percent with public debt	39		35		42		46	
Percent with commercial paper	7.6		5.2		8		12	

because firms leave our sample, Table II provides summary statistics for the surviving firms. Changes in the financial characteristics of surviving firms over time are similar to the changes for the entire sample, suggesting that changes in firm characteristics are not the result of a change in the sample over time.

The mean and median leverage (defined as short plus long-term debt divided by assets) for the firms in our sample are 0.39 and 0.35, respectively. The mean and median leverage for the firms in our sample are similar to the average leverage of publicly traded U.S. firms (see, for example, Ross, Westerfield, and Jaffe (1993) and Rajan and Zingales (1995)). The average leverage increases from 35 percent in 1980 to 40 percent in 1990 (the mean and median leverage ratios are significantly higher at the 0.01 level in 1990 than in 1980).¹⁰ As discussed below, the increase in leverage is not solely the result of an increased use of public debt; firms that rely only on private debt also increased their use of leverage in the 1980s.

¹⁰ We use a Wilcoxon Sum Rank test to test for differences in medians.

Table II

**Descriptive Statistics Concerning the Financial Characteristics and
Debt Structure for Firms with Information Available in All Years
(N = 161)**

The sample consists of observations from 1980, 1985, and 1990 for 250 randomly selected exchange and National Association of Securities Dealers (NASD) traded firms with long term debt outstanding in 1980. Financial information is from COMPUSTAT, 10K filings, and annual reports. Leverage is measured as short plus long term debt divided by total assets. The market to book ratio is the book value of liabilities and preferred stock plus the market value of common stock divided by the book value of assets. Bank debt is from the firm's annual report or 10K filing. Total debt equals short plus long term debt less industrial revenue bonds, mortgages, and capitalized leases. Other private debt is privately placed bonds and loans specified in the financial statements as being from nonbank sources.

	Overall		1980		1985		1990	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Assets (millions)	1835	136	1163	87	1676	136	2666	225.1
Leverage	0.39	0.36	0.37	0.35	0.35	0.33	0.45	0.40
Coverage ratio	12.15	3.15	13.84	4.03	15.75	3.32	6.91	2.32
Market/book	1.46	1.11	1.41	1.06	1.36	1.19	1.62	1.07
Bank debt/total debt	0.63	0.72	0.63	0.73	0.66	0.77	0.59	0.69
Public debt/total debt	0.16	0.00	0.15	0.00	0.16	0.00	0.17	0.00
Commercial paper/total debt	0.02	0.00	0.01	0.00	0.02	0.00	0.03	0.00
Other private/total debt	0.13	0.00	0.17	0.00	0.11	0.00	0.11	0.01
Unused lines of credit/total bank debt	2.75	0.47	3.12	0.48	1.58	0.52	3.60	0.46
Unused lines of credit/assets	0.11	0.07	0.11	0.05	0.10	0.09	0.13	0.08
Percent with multiple banking relationships	67		63		70		68	
Percent with secured bank debt	33		36		28		34	
Percent with public debt	41		37		41		46	
Percent with commercial paper	9		6		9		12	

To assess the importance of bank and other forms of debt in corporate financing, we compute the total amount of nonmortgage related debt for each firm in our sample. Total nonmortgage debt includes short plus long-term debt less mortgage debt, industrial revenue bonds, loans from stockholders, and capitalized lease obligations. We exclude mortgage debt, capitalized leases, and industrial revenue bonds from our total measure since we focus on the choice of public and private debt raised from external sources for general corporate purposes. The ratio of bank, public debt, and other private debt is computed relative to this total debt measure.¹¹

As shown in Table I, bank debt is, on average, the largest source of debt financing for the firms in our sample. The mean and median proportion of bank debt are 0.64 and 0.77, respectively. As discussed earlier, some firms do not

¹¹ For firms with no debt outstanding, the ratios are set equal to zero. Excluding these observations does not qualitatively affect our results. In our regression results, which are presented below, we exclude firms that have no debt outstanding.

specifically identify their private debt as being bank debt. As a result, the summary statistics are likely to overstate the level of bank financing.

Table I provides information concerning firm borrowing patterns over time. As shown in Table I, the importance of bank financing declined over the decade (primarily during the 1985 through 1990 period). However, the mean and median ratios of bank debt to total debt in 1990 are not significantly different from the ratios in 1980. The decline in the mean and median ratio of bank debt to total debt outstanding appears to be the result of firms issuing public debt for the first time during the 1980s. Specifically notice that the percentage of firms with public debt outstanding increased from 35 percent in 1980 to 46 percent in 1990. The firms in our sample that issued public debt for the first time during the 1980s account for the decreasing proportion of bank debt. In particular, these firms reduced the proportion of bank debt used from an average of 74 percent in 1980 to 52 percent in 1990 (the median declined from 96 percent to 64 percent). In contrast, the percentage of bank debt to total debt outstanding for firms not using public debt remained constant over the decade (the mean and median percentage of bank debt in 1980 are 79 percent and 98 percent in both 1980 and 1990).¹² In addition, firms that had either public debt or commercial paper outstanding in 1980 did not reduce the percentage of bank debt used (the mean and median percentage of bank debt to total debt are approximately 50 percent in both 1980 and 1990 for these firms).¹³

The proportion of bank loans to total debt outstanding measures only one aspect of a bank relationship. Banks also provide liquidity by providing lines of credit. The proportion of unused lines of credit to total assets also changed very little during the decade (suggesting a continued importance of bank relationships). Overall, our results suggest that the decline in the importance of bank lending arises not from a substitution of public claims for bank claims, but rather from firms using public debt claims to increase overall leverage.¹⁴

Two additional descriptive statistics in Table I deserve mention. First, notice that the majority (66 percent) of the firms in our sample maintain multiple banking relationships. The average number of bank relationships reported is 5.22.¹⁵ Multiple banking relationships can arise from borrowing from bank syndicates or from separate loans from several banks. Thirty-four percent of these firms have multiple banking relationships because they borrow through syndicates of banks. Second, roughly one-third of the firms in the sample have bank debt that is secured. This proportion remains relatively constant over the decade and is similar for surviving and nonsurviving firms.

It is interesting to compare the pattern of borrowing for the firms in our sample to the pattern of borrowing for smaller companies. For example,

¹² Commercial paper constituted two percent of total debt financing in 1980. This percentage increased to six percent in 1990.

¹³ In Houston and James (1995), we examine in detail the changes in the reliance of bank financing over the decade and the effects of these changes on firms' investment behavior.

¹⁴ Boyd and Gertler (1994) report similar results using Flow of Funds data.

¹⁵ In many cases, the annual report only indicates that multiple banks are involved and does not indicate the number of banks involved.

Petersen and Rajan (1994) find that the average fraction of borrowing from commercial banks is 62 percent for the largest firms in their sample (with assets over \$2.3 million), which is similar to the average ratio of bank debt in our sample.¹⁶ Not surprisingly, the proportion of firms with multiple banking relationships is substantially smaller among the small firms in their sample (18 percent versus 66 percent in our sample). For firms in our sample, we find that the likelihood of multiple relationships is positively related to firm size. For example, among firms with assets below the median, 43 percent have multiple banking relationships. In contrast, among firms with assets greater than the median, 88 percent have multiple banking relationships.

As discussed earlier, annual reports frequently do not distinguish between bank debt and other private debt claims. As a result, our measure of bank debt may overstate the importance of bank debt. An alternative way of measuring the importance of bank loans is to consider the nature of the loan agreement. In particular, we classify bank loans according to whether the loan is 1) an extension on a line of credit or revolving credit agreement, 2) a short-term note (maturity under 5 years), or 3) a term loan (maturity greater than 5 years). Since banks tend to specialize in short-term lending (see Federal Reserve Bulletin (1993)), loans made under revolving credit or lines of credit are most likely to constitute commercial bank loans. Table III provides descriptive statistics concerning the proportion of total debt from each of the three categories of bank loans.

As shown in Table III, the largest category of bank loans is short-term borrowing, which includes short-term notes as well as borrowing under lines of credit. This is consistent with the widely held view that banks specialize in short-term commercial loans (the mean and median ratio of short-term bank loans to total bank loans in our sample are 58 percent and 65 percent, respectively). However, the proportion of bank debt that is long term (over 5 years) in our sample is higher than that reported in the aggregate statistics provided by the Federal Reserve. In particular, in 1980, approximately 85 percent of bank loans had a maturity under 5 years (see Federal Reserve Bulletin (1993)). In contrast, on average, 42 percent of bank debt in our sample is long term.

Finally, the share of total bank lending to total debt in our sample appears to be considerably higher than the share of bank loans to total business sector debt computed from Flow of Funds data.¹⁷ For example, for year end 1990, the Flow of Funds data indicate that corporate bonds (both public and private) constitute 46 percent of total nonmortgage-related corporate debt. The com-

¹⁶ Petersen and Rajan (1994) measure the ratio of bank debt to total debt slightly differently than we do. (They include mortgage-related debt and loans from stockholders.) They find an average ratio of debt from owners and family members of 10 percent for the largest firms. The average proportion of debt from nonbank financial institutions is 14 percent.

¹⁷ We use information on claims outstanding from the Flow of Funds Quarterly Reports.

Table III

Proportion of Total Debt from Commercial Banks Grouped by Type of Bank Loan

The sample consists of observations from 1980, 1985, and 1990 for 250 randomly selected exchange and National Association of Securities Dealers (NASD) traded firms with long term debt outstanding in 1980. Financial information is from COMPUSTAT, 10K filings, and annual reports. Leverage is measured as short plus long term debt divided by total assets. Borrowing on lines of credit equals borrowing on bank supplied revolving credit agreements or lines of credit. Term borrowing equals term loans from commercial banks and term loans not specified as being from nonbank lenders. Short-term borrowing (under 5 years) equals short-term loans from commercial banks and short-term loans not specified as being from nonbank lenders. Short-term loans include loans made as part of a line of credit.

All Firms	Entire Period		1980		1985		1990	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Borrowing on lines/total debt	0.22	0.00	0.19	0.00	0.24	0.00	0.23	0.00
Term borrowing/total debt	0.28	0.09	0.28	0.05	0.30	0.13	0.25	0.00
Short-term borrowing/total debt	0.36	0.24	0.38	0.26	0.36	0.24	0.34	0.14
All bank borrowing/total debt	0.64	0.77	0.66	0.82	0.66	0.80	0.59	0.69
Surviving firms only ($N = 161$)								
Borrowing on lines/total debt	0.22	0.00	0.18	0.00	0.25	0.00	0.23	0.00
Term borrowing/total debt	0.27	0.09	0.27	0.10	0.29	0.10	0.25	0.00
Short-term borrowing/total debt	0.36	0.19	0.36	0.20	0.37	0.29	0.34	0.14
All bank borrowing/total debt	0.63	0.72	0.63	0.73	0.66	0.77	0.59	0.69

parable number for the firms in our sample is 35 percent.¹⁸ Flow of Funds data for 1990 also indicate that approximately 26 percent of corporate debt financing is in the form of bank loans. For firms in our sample, the proportion for 1990 is 54 percent.

There are several potential explanations for the higher proportion of bank debt in our sample. First, as discussed above, in many cases firms do not distinguish between bank debt and other private debt on their balance sheets. As a result, our measure of bank debt is likely to be biased upward. Second, Flow of Funds data reflect loans funded by the banking sector. To the extent that banks originate and sell commercial loans and these loans continue to be reported on the borrower's balance sheet as bank loans, the Flow of Funds measure will understate the proportion of loans originated by the banking sector (Boyd and Gertler (1994) make this point).¹⁹ Finally, Flow of Funds data include, as part of credit market instruments, capitalized leases that we exclude from our measure of total debt. In Section IV, we discuss the extent to which our results are affected by the way in which bank debt is defined.

¹⁸ The descriptive statistics on debt structure in Table I are not directly comparable to those obtained from Flow of Funds data because they are based on ratios for individual firms. In computing the comparable number, we calculate a ratio using aggregate data.

¹⁹ At the same time, the control benefits from bank lending are likely to be diminished if the bank sells the loan.

Overall, the results in Tables I through III indicate that bank debt is, on average, the major source of debt financing for the firms in our sample. Moreover, while the average proportion of bank debt used declined over the decade, the decline appears to be the result of an increase in the overall use of debt financing and an increase in the proportion of firms issuing public debt. Finally, the majority of firms in our sample rely on multiple banking relationships.

To investigate differences in firm characteristics, we divide the sample according to whether the firm has 1) multiple banking relationships or 2) any outstanding public debt. Table IV provides descriptive statistics for the firms grouped by multiple banking relationships. As shown in Table IV, firms with multiple banking relationships are larger and have longer operating histories than firms with a single bank relationship. Since information asymmetries are generally assumed to be larger for smaller and younger firms, the results in Table IV provide some support for our conjecture that bank information monopolies are more severe for firms with single banking relationships. As shown in Table IV, firms with multiple banking relationships rely more heavily on banks for debt financing than do firms with single bank relationships. This is consistent with the argument that firms with single bank relationships substitute away from bank debt. The greater reliance on bank debt by firms that maintain multiple relationships is also consistent with the argument that multiple banking relationships serve to mitigate information monopolies that limit the use of bank debt.

We also find that investment expenditures (relative to assets) are slightly lower for firms with a single bank relationship (although the difference is not statistically significant at the 0.10 level) and that firms with multiple relationships realize significantly higher levels of asset growth than do firms with a single banking relationship. Finally, the level of profitability, as measured by the median ROA, is virtually the same for the two subsamples.

During the sample period, 17 firms switched from a single bank relationship to a multiple banking relationship. These firms increase significantly their reliance on bank financing. In particular, for the period prior to the switch, the mean and median ratio of bank debt to total debt outstanding are 0.50 and 0.60, respectively. After the switch, the mean and median increase to 0.76 and 0.95, respectively (the increase is statistically significant at the 0.05 level).²⁰ We also examine whether there were significant changes in the firms' characteristics that coincided with the switch to multiple lenders. After the switch, the average firm had slightly more leverage, a lower coverage ratio, a higher market to book ratio, and a slight decline in the ratio of its investments to total assets relative to preswitch levels. None of these differences are statistically significant. Finally, firms increased significantly in size after switching to

²⁰ Firms that did not change the number of lenders used did not significantly increase their use of bank debt.

Table IV

Descriptive Statistics Concerning the Financial Characteristics and Debt Structure for Firms Sorted by Whether they have Multiple Banking Relationships

The sample consists of observations from 1980, 1985, and 1990 for 250 randomly selected exchange and National Association of Securities Dealers (NASD) traded firms with long term debt outstanding in 1980. Financial information is from COMPUSTAT, 10K filings, and annual reports. Leverage is measured as short plus long term debt divided by total assets. The market to book ratio is the book value of liabilities and preferred stock plus the market value of common stock divided by the book value of assets. Bank debt is from the firm's annual report or 10K filing. Total debt equals short plus long term debt less industrial revenue bonds, mortgages, and capitalized leases. Other private debt is privately placed bonds and loans specified in the financial statements as being from nonbank sources. Investment equals capital expenditures as reported in COMPUSTAT. Fixed assets are plant, property, and equipment.

	Firms With One Bank		Firms with Multiple Banks	
	Mean	Median	Mean	Median
Assets (millions)	137.96*	26.78*	1933.64	251.38
Age (years since incorporated)	21*	24*	49	48
Leverage	0.36	0.34	0.40	0.37
Coverage ratio	12.44*	3.07	6.81	3.24
R&D/sales	0.041	0.017	0.032	0.018
Market/book	1.57	1.04	1.32	1.07
Bank debt/total debt	0.55*	0.75	0.69	0.82
Bank debt/assets	0.07*	0.13*	0.13	0.17
Public debt/total debt	0.13	0.00	0.18	0.00
Other private/total debt	0.23*	0.014	0.087	0.01
Investment/assets	0.07	0.05	0.08	0.07
Growth in assets over five years**	0.353*	0.218*	0.939	0.463
Return on assets (ROA)	0.044	0.095	0.092	0.095
Fixed assets/assets	0.262*	0.293*	0.35	0.31
Unused lines of credit/assets	0.065	0.143*	0.106	0.123
Percent with public debt	21.7		36.0	
Percent with restructured debt***	2.22		5.33	
Number	135		261	

* Significantly different from the multiple bank group at the 0.05 level.

** Calculated only for years 1985 and 1990.

*** Firms that indicated in their financial reports that they restructured their debt in the fiscal year.

multiple lenders.²¹ Over the same time period, eight firms switched from a multiple banking relationship to a single banking relationship. Apart from leverage which increased significantly, there were no significant changes in the firms' characteristics that coincided with these shifts.

²¹ The median firm that switched to multiple lenders realized a 66.2 percent increase in total assets over the five year period. By contrast, the median firm with a single banking relationship realized only a 21.8 percent increase in total assets over the five-year period.

Table V
Descriptive Statistics Concerning the Financial Characteristics
and Debt Structure for Firms Sorted by whether they have
Public Debt Outstanding

The sample consists of observations for 1980, 1985, and 1990 for 250 randomly selected exchange and National Association of Securities Dealers (NASD) traded firms with long term debt outstanding in 1980. Financial information is from COMPUSTAT, 10K filings, and annual reports. Leverage is measured as short plus long term debt divided by total assets. The market to book ratio is the book value of liabilities and preferred stock plus the market value of common stock divided by the book value of assets. Bank debt is from the firm's annual report or 10K filing. Total debt equals short plus long term debt less industrial revenue bonds, mortgages, and capitalized leases. Other private debt is privately placed bonds and loans specified in the financial statements as being from nonbank sources. Investment equals capital expenditures as reported in COMPUSTAT. Fixed assets are plant, property, and equipment.

	Firms Without Public Debt		Firms with Public Debt	
	Mean	Median	Mean	Median
Assets (millions)	528*	63.9*	3127	5
Age	34*	42.1*	47.4	46
Leverage	0.31*	0.33*	0.41	0.51
Coverage ratio	15.38*	3.54	3.94	3.08
R&D/sales	0.04	0.02	0.05	0.02
Market/book	1.42	1.07	1.30	1.08
Bank debt/total debt	0.73*	0.97*	0.50	0.51
Bank debt/assets	0.15	0.11	0.17	0.12
Public debt/total debt	0.00	0.00	0.34	0.40
Commercial paper/total debt	0.00	0.00	0.03	0.00
Other private/total debt	0.14*	0.01	0.07	0.01
Investment/assets	0.07	0.06	0.08	0.07
Fixed assets/assets	0.32*	0.30	0.36	0.30
Growth in Assets over five years**	0.602	0.447	0.955	0.376
Return on assets (ROA)	0.078	0.094	0.081	0.096
Unused lines of credit/assets	0.11	0.063	0.15	0.09
Percent with secured bank debt	30		32	
Percent with multiple banking relationships	54		84	
Percent with restructured debt***	2.8		5.1	
Number	372		213	

* Significantly different from the public debt group at the 0.05 level.

** Calculated only for years 1985 and 1990.

*** Firms that indicated in their financial reports that they restructured their debt in the fiscal year.

Table V provides descriptive statistics for firms grouped by whether they have public debt outstanding. As expected, firms with public debt are, on average, larger, older, and more highly levered (the mean and median asset size are significantly greater at the 0.01 level). The average market to book ratio is roughly the same for the two sets of firms. The univariate results suggest that the nature of firm assets has little effect on the firm's decision to issue public debt.

As expected, firms with public debt outstanding have a lower ratio of bank debt to total debt. Interestingly, however, firms that have public debt, on average, still rely on private debt financing for the majority of their debt financing. For example, roughly half of their debt is issued by a bank. In addition, firms with public debt outstanding maintain slightly higher unused credit lines relative to total assets than firms with no public debt outstanding (the difference in means and medians are not significantly different from zero). Finally, a significantly higher percentage of firms with public debt outstanding also maintain multiple banking relationships. Specifically notice that 84 percent of the firms with public debt outstanding also maintain multiple banking relationships.

IV. Multivariate Analysis of the Reliance on Bank Loans

When examining the relation between the reliance on bank debt financing and hold-up problems, we use two proxies for potential hold-up problems. The first measure is the market to book value of the firm's assets. We compute market to book in the same way as Smith and Watts (1992).²² The second proxy for the importance of growth opportunities is the ratio of R&D expenditures to total firm sales.

As discussed in Section II, if public debt or multiple banking relationships serve to mitigate hold-up problems, the relation between the reliance on bank debt and our measures of growth opportunities is expected to vary depending on whether the firm uses public debt (either long-term public debt or commercial paper) or multiple banking relationships. To examine this issue, we construct a dummy variable *Public*, which equals one if the firm has public debt or commercial paper outstanding in a given year, zero otherwise. In addition, we construct a dummy variable *Multiple*, which equals one if the firm has loans outstanding from more than one bank, zero otherwise. We also interact *Multiple* and *Public* with our measures of the importance of growth opportunities. If public debt or multiple banking relationships are used to mitigate hold-up problems, then the coefficients on these interactive variables are expected to be positive.

In examining the relation between bank borrowing and growth opportunities, we control for differences in firm size, leverage, and coverage ratios. To account for possible changes in the reliance on bank debt through time, we include dummy variables for observations from 1985 and 1990. If there is a secular decline in the reliance on bank borrowing after controlling for firm characteristics, the expected sign of the time dummy variables is negative.

²² Since reliance on bank financing may affect investment efficiency, individual firms' market to book ratios may be endogenous. To control for potential endogeneity, we also measure growth opportunities using the median market to book ratio for firms in the same industry as the firms in our sample (as defined by four digit SIC codes).

A. The Effects of Multiple Banking Relationships

Ordinary least squares (OLS) estimates of the relation between the proportion of bank debt used and firm characteristics are presented in Table VI. Each of the estimates are corrected for heteroskedasticity using White's (1980) adjustment. Because the dependent variable (the proportion of bank debt used) is constrained to be between zero and one, we also include in Table VI the results of two-sided Tobit regressions.²³

Table VI focuses on whether the level of growth opportunities affects a firm's reliance on bank debt, and whether this result differs depending on whether the firm has multiple banking relationships. As shown in the table, among firms that use only a single bank lender, there is a negative and significant relationship between the proportion of bank financing and each of the two proxies for the level of growth opportunities (the market to book ratio and R&D expenditures relative to total sales). This result is inconsistent with the widespread argument that firms with greater growth opportunities rely more heavily on bank financing. This result, however, is not inconsistent with the argument that firms with greater growth opportunities are more likely to limit their use of bank financing due to potential hold-up problems.

Bank information monopolies appear to be less severe among firms with multiple banking relationships. Specifically, using market to book as a measure of growth opportunities, the multiple banking relationships interactive variable is positive and statistically significant. Indeed, for firms with multiple banking relationships, we find a positive and statistically significant relationship between the ratio of bank debt to total debt and the market to book ratio.²⁴ This result is consistent with multiple banking relationships mitigating hold-up problems or with firms with multiple banking relationships facing lower set-up costs associated with bank relationships.²⁵

We obtain similar results using R&D relative to total sales as a proxy for growth opportunities. Specifically, notice that the coefficient on R&D expenditures is negative and statistically significant at the 0.10 level. Moreover, the coefficient on the multiple bank interactive variable is positive and statistically significant for two of the three specifications.²⁶

The results in Table VI also suggest that larger firms and more highly levered firms rely less on bank financing. Larger firms presumably have fewer information asymmetries and therefore have less of a need for private lending (see Hooks and Opler (1993)). In addition, large fixed costs and the correspond-

²³ We also estimate a fixed-effects model to account for potential autocorrelation in the panel data. The results of the fixed-effects model are similar to those reported in Table VI.

²⁴ When the regression in column one of Table VI is estimated using only firms with multiple banking relationships, the coefficient on the market to book ratio is 0.01 and the *t*-statistic is 2.09, significant at the 0.05 level.

²⁵ The results using the industry's market to book ratio as the proxy for growth opportunities are similar (though less robust) to those using the firm's market to book ratio.

²⁶ One concern with the R&D proxy is that this information is reported in less than half of the available firms. Moreover, they may be reported only for firms in certain industries, thereby creating a potential sample selectivity bias.

Table VI

Regression Results Relating the Ratio of Book Loans to Total Debt to Firm Characteristics

The regression is based on a sample of 250 publicly traded firms for 1980, 1985, and 1990. The dependent variable is bank loans to total debt. Leverage equals short plus long term debt divided by total assets. Market to book ratio equals book value of assets minus book value of equity plus the market value of equity divided by the book value assets. Multiple banks is a dummy variable that equals one if the firm reports multiple banking relationships in its financial statements. *t*-statistics are in parentheses and for ordinary least squares (OLS) results are based on White corrected standard errors.

	(1)	(2)	(3)*	(4)	(5)	(6)*
Number	358	358	358	158	158	158
Intercept	0.821 (14.202)	0.789 (12.967)	0.915 (9.612)	0.796 (9.802)	0.732 (8.293)	0.769 (6.192)
Coverage	-0.002 (-2.002)	-0.002 (-1.841)	-0.002 (-1.722)	-0.000 (-0.339)	-0.000 (-0.253)	-0.000 (-0.092)
Leverage	-0.042 (-2.105)	-0.045 (-2.243)	-0.057 (-1.711)	-0.028 (-2.239)	-0.035 (-2.923)	-0.032 (-0.699)
Log assets	-0.030 (-2.279)	-0.039 (-3.942)	-0.063 (-3.770)	-0.021 (-2.122)	-0.036 (-3.239)	-0.050 (-2.460)
Market/book	-0.045 (-3.377)	-0.033 (-2.503)	-0.051 (-2.071)			
Multiple banks × Market/book	0.069 (3.990)	0.044 (3.078)	0.066 (2.070)			
R&D/sales				-1.967 (-3.694)	-1.373 (-2.182)	-1.922 (-1.651)
Multiple banks × R&D/sales				2.280 (2.301)	0.800 (1.142)	1.355 (1.747)
Multiple banks (dummy)		0.126 (2.259)	0.213 (2.553)		0.212 (2.339)	0.278 (2.333)
Dummy 1985	0.019 (0.453)	0.010 (0.241)	0.020 (0.271)	0.011 (0.154)	0.013 (0.182)	0.051 (0.517)
Dummy 1990	0.064 (1.190)	0.065 (1.233)	0.070 (0.899)	-0.012 (-0.150)	0.017 (0.232)	0.055 (0.522)
σ^2 from Tobit estimates			0.517 (19.273)			0.483 (13.200)
R ²	0.057	0.071		0.062	0.101	

* Double-sided Tobit estimates.

ing economies of scale of issuing public claims may explain why large firms rely less on bank financing. The negative relationship between firm leverage and the proportion of bank financing is consistent with either economies of scale in issuing public claims or the notion that bank monitoring is a public good, in which case firms with more leverage (controlling for the size of the firm) may

use the same level of bank debt, implying a smaller bank debt to total debt ratio.

Moreover, firms with high coverage ratios rely less on bank debt. Assuming that higher coverage ratios proxy for firm quality, this result is consistent with the predictions of Diamond (1991) and Blackwell and Kidwell (1988) that higher quality firms rely less heavily on bank borrowing.

A final result from Table VI that deserves mention is the coefficients on the time dummies. Their insignificance suggests that, controlling for firm characteristics, there is no secular trend away from bank financing. To the extent that bank lending is declining in importance, it can be attributed to changing firm characteristics rather than changes in the overall financial environment. This result has important implications for the recent literature, which has focused on the decline in banking.

Our results appear to be robust to alternative specifications of the empirical model. For example, when we include measures of firm profitability (return on assets or return on book equity) and the ratio of fixed assets (plant property and equipment) to total assets, these variables are statistically insignificant; and the size and significance of the other variables are similar to those reported in Table VI. We also estimate the empirical model using the firm's price earnings ratio (the beginning of the year stock price relative to net income per share) as a measure of the importance of growth opportunities. Again, the results are similar to those reported in Table VI.

The results reported in Table VI are based on an assumption that a single banking relationship is either exogenous or uncorrelated with other (omitted variables) that affect the reliance on bank debt. While we cannot completely rule out this possibility, below we explore several alternative explanations for our findings.

B. Investment Activity and the Number of Banking Relationships

An alternative explanation for the positive coefficient on the multiple bank/growth opportunities interaction variable in Table VI is that investment activity varies systematically with the number of banks the firm uses. In particular, suppose that information monopolies are not important and that instead a single banking relationship increases a firm's access to bank financing (by enhancing lender control). As a result, firms with a single banking relationship invest more which, in turn, lowers the firm's market to book ratio (i.e., the Tobin's Q is driven to one).²⁷ This "reverse causality" story predicts a negative relation between the reliance on bank debt and the firm's market to book ratio for firms with a single banking relationship. The reverse causality argument suggests that firms with a single banking relationship invest more than firms with multiple banking relationships. However, the descriptive

²⁷ We thank the referee for bringing this argument to our attention.

statistics reported in Table IV suggest that investment levels do not vary significantly with the number of bank lenders the firm uses.²⁸

Another measure of the extent to which firms are constrained in their investments is the growth in total assets. As shown in Table IV, the average five-year growth rate among firms with multiple relationships is more than twice that found for firms with a single banking relationship. Again, these results provide indirect support for the argument that single banking firms are constrained by the fact their lender has an information monopoly.

C. Differences in the Reliance on Bank Financing

In examining the importance of bank financing, bank debt is scaled by total nonmortgage debt outstanding. While this provides a measure of the importance of bank debt relative to other types of debt claims, it may not provide a good measure of the control banks can exert (or the information monopoly the bank may have). Specifically, firms who are financed largely by equity may maintain a small amount of bank debt for transaction purposes (e.g., to finance accounts receivable). For these firms, the proportion of bank debt to total debt will be very high, but the control effects of bank financing are likely to be small. To examine whether our results are sensitive to including these firms, we reestimate the empirical model using 1) firms with leverage ratios greater than 0.1 (the ratio for the bottom quartile based on leverage), and 2) firms with a ratio of bank debt to total assets greater than 0.03 (the ratio for the bottom quartile based on bank debt to total assets). The results, reported in Table VII, are similar to those reported in Table VI (although the statistical significance of our proxies for growth opportunities is generally lower).

D. Evidence Regarding Firms That Issue Exclusively Private Debt and Small Firms

To further test the robustness of our results, we focus on firms that rely exclusively on private debt. By eliminating firms with public debt, we can obtain perhaps a cleaner test of whether multiple banking relationships mitigate hold-up problems. The results reported in the last two columns of Table VII are consistent with the hypothesis that multiple banking relationships mitigate hold-up problems. Among single lender banks, there is a negative correlation between the average firm's reliance on bank debt and each of the two proxies for growth opportunities. This result is reversed if the bank has multiple banking relationships.

Finally, as shown in Table IV, firms with multiple banking relationships are typically larger than firms that rely on a single bank. While we control for the effects of asset size in the regression analysis, the dummies may also proxy for

²⁸ In a related article, Houston and James (1995) examine the differences in cash flow sensitivity of investment expenditures based on the nature of the firms' banking relationships. They find that firms with single banking relationships are more cash flow sensitive than firms that use multiple lenders.

Table VII

Regression Results Relating the Ratio of Bank Loans to Total Debt to Firm Characteristics for Firms Meeting Minimum Leverage and Bank Loan to Asset Ratios and for Firms without Public Debt

The regression is based on a sample of 250 publicly traded firms for 1980, 1985, and 1990. The dependent variable is bank loans to total debt. Leverage equals short plus long term debt divided by total assets. Market to book ratio equals book value of assets minus book value of equity plus the market value of equity divided by the book value assets. Multiple banks is a dummy variable that equals one if the firm reports multiple banking relationships in its financial statements. *t*-statistics are in parentheses and are based on White corrected standard errors.

	Firms with Leverage Greater Than 0.10		Firms with Bank Loans/Assets Greater Than 0.03		Firms with No Public Debt	
	(1)	(2)	(3)	(4)	(5)	(6)
Number	319	125	278	124	203	87
Intercept	0.809 (9.294)	0.811 (6.421)	1.045 (23.92)	1.057 (14.488)	0.787 (9.387)	0.722 (6.191)
Coverage	0.000 (0.214)	0.000 (0.097)	0.0046 (2.762)	0.0023 (1.139)	-0.001 (-0.593)	0.001 (0.702)
Leverage	-0.089 (-0.845)	-0.052 (0.645)	-0.037 (-1.423)	-0.030 (-1.493)	-0.022 (-1.616)	-0.014 (-1.014)
Log assets	-0.040 (-3.783)	-0.032 (-2.431)	-0.055 (-7.113)	-0.044 (-4.220)	-0.009 (-0.485)	-0.013 (-0.595)
Market/book	-0.027 (-1.881)		-0.021 (-3.103)		-0.031 (-2.318)	
Multiple banks × Market/book	0.034 (2.234)		0.020 (2.183)		0.046 (2.509)	
Multiple banks (dummy)	0.123 (2.126)	0.124 (1.149)	0.019 (0.463)	0.000 (0.001)	0.099 (1.540)	0.140 (1.414)
R&D/sales		-1.355 (-1.858)		-1.418 (-1.045)		-1.211 (-1.572)
Multiple banks × R&D/sales		0.764 (1.612)		1.809 (1.573)		2.298 (2.189)
Dummy 1985	0.015 (0.363)	-0.025 (0.313)	-0.014 (-0.473)	-0.066 (-1.312)	0.070 (1.427)	0.095 (1.087)
Dummy 1990	0.054 (0.984)	-0.025 (-0.339)	-0.071 (1.842)	-0.082 (-1.366)	0.054 (0.886)	0.084 (0.892)
R ²	0.06	0.07	0.210	0.216	0.095	0.154

firm size and not the effect of lender competition. To examine this issue, we divide our sample into two groups: firms with assets below the median and firms with assets above the median. We then reestimate the regressions in Table VI for the two groups. Not surprisingly, the effect of multiple banking relationships is strongest for the smaller firms. For both groups (not reported), we find a negative relation between the proportion of bank debt used and the

market to book ratio (although the relation is not statistically significant for the largest firms).

E. The Similarity of Multiple Banks and Public Debt

The results in Table VI suggest that establishing multiple banking relationships may be one way to mitigate hold-up problems. Arguably, firms are also less likely to suffer hold-up problems if they have access to public debt markets. This issue is considered in the first column of Table VIII. Among firms that do not have public debt, there is a negative relationship between the market to book ratio and the proportion of bank debt. This result is again consistent with the argument that high market to book firms suffer the most from being held up by their lender and therefore are likely to limit their use of bank financing unless they are able to find a mechanism to mitigate the hold-up problem. The positive and significant coefficient on the term that interacts public debt and the market to book ratio indicates that public debt does provide a mechanism to reduce hold-up problems.

The third column in Table VIII examines whether the existence of other private debt financing serves to limit hold-up problems in a way similar to that of multiple bank debt or public debt. We find that high market to book firms with other private debt outstanding use bank debt no more intensively than firms that do not have other private debt financing. This result suggests that the existence of other private debt does not enable firms to avoid hold-up problems. One explanation for this result is that other private debt is used to finance activities that are different from those where bank debt is used (for example, to finance fixed assets or long-term projects). Other private lenders, therefore, may be unable or unwilling to resolve hold-up problems between firms and their bankers.²⁹

The previous results suggest that establishing either multiple banking relationships or issuing public debt are two ways in which firms may mitigate hold-up problems. Alternatively, these firms face lower set-up costs associated with bank relationships. To the extent these two mechanisms are similar to one another, we would expect a negative relation between the amount of growth opportunities a firm has and its reliance on bank debt to exist only for firms that use a single bank lender and do not have public debt outstanding.

To test this hypothesis, we create a dummy variable that equals 1 if the firm has either multiple banking relationships or public debt. This variable is interacted with our two proxies for growth opportunities. Consistent with the previous results, we find a positive and statistically significant coefficient on the interactive variable. This result is consistent with the hypotheses that

²⁹ These results should be interpreted with caution. In our sample, debt is classified as other private debt only in those cases where a nonbank private lender was explicitly mentioned in the financial statements. Some of what we classify as "bank debt" may be other private debt. This leaves open the possibility that other private lenders may mitigate hold-up problems in a way similar to bank lenders, provided they are providing "bank-like" services.

Table VIII

Regression Estimates Relating the Ratio of Bank Loans to Total Debt to Firm Financial Characteristics and Whether the Firm Uses Public Debt or Nonbank Private Debt

The regression is based on a sample of 250 publicly traded firms for 1980, 1985, and 1990. The dependent variable is bank loans to total debt. Leverage equals short plus long term debt divided by total assets. Market to book ratio equals book value of assets minus book value of equity plus the market value of equity divided by the book value of assets. Public debt equals one if the firm has public debt outstanding. Other private equals one if the firm has nonbank private debt outstanding. *t*-statistics are in parentheses and for ordinary least squares (OLS) results are based on White corrected standard errors.

	(1)	(2)*	(3)	(4)*
Number	502	502	531	531
Intercept	0.746 (16.374)	0.840 (12.419)	0.825 (18.263)	0.795 (16.773)
Coverage	-0.000 (-0.064)	0.001 (0.611)	-0.001 (-1.743)	0.001 (1.340)
Leverage	-0.014 (-0.777)	-0.003 (-0.073)	-0.018 (-0.810)	-0.044 (-1.521)
Log assets	0.022 (2.860)	0.325 (2.788)	-0.009 (-1.260)	-0.015 (-1.947)
Market/book	-0.017 (-1.597)	-0.028 (-1.675)	-0.003 (-0.345)	-0.017 (-1.540)
Public debt (dummy) $\times$ market/book	0.027 (2.338)	0.039 (1.571)		
Public debt (dummy)	-0.387 (-11.025)	-0.578 (-9.947)		
Other private debt (dummy) $\times$ market/book			-0.008 (-0.538)	-0.060 (-0.634)
Other private debt (dummy)			-0.017 (-0.222)	0.022 (0.183)
Dummy 1985	0.020 (0.661)	0.040 (0.857)	0.010 (0.283)	0.054 (0.990)
Dummy 1990	-0.017 (-0.434)	-0.043 (-0.813)	-0.044 (-1.006)	-0.720 (-0.176)
σ^2 from Tobit estimates		0.431 (25.532)		0.488 (23.250)
R ²	0.212		0.085	

* Double-sided Tobit estimates.

multiple banking relationships and/or public debt are associated with firms facing less severe hold-up problems.

We also test this hypothesis by including separate multiple bank and public debt interactive variables in the regression. With this specification, the multiple bank interactive variable is positive and statistically significant, but the

public debt interactive variable is not significantly different from zero. This result, while inconsistent with the hypothesis that public debt and multiple banking relationships are similar mechanisms for mitigating hold-up problems, should be interpreted with caution. In particular, as shown in Table V, 84 percent of the firms with public debt outstanding also have multiple banking relationships (only 17 firms per year have public debt but maintain a single bank relationship). As a result, separating the effect of these two mechanism is difficult based on our limited sample.

F. Bank Debt vs. Short-Term Debt

Our results suggest that a firm's reliance on bank debt depends on the firm's investment opportunity set and whether or not the firm has multiple banking relationships and/or public debt outstanding. One could argue that investment opportunity sets also influence debt maturity. Indeed, Barclay and Smith (1995) show that firms with fewer growth opportunities (using market to book and R&D expenditures relative to sales as proxies) rely more heavily on long-term debt. Their analysis does not distinguish between public and private debt, although they acknowledge that most bank debt is short term.

To further examine this issue, we reestimate the regressions in Table VI using the percentage of firm debt which matures in more than three years as the dependent variable (this is the cutoff used by Barclay and Smith (1995)). The results are similar to our original findings—the use of long-term debt is positively related to the market to book ratio (which is the opposite of that found by Barclay and Smith (1995)) unless firms have multiple banking relationships. When firms have multiple banking relationships, there is a negative relationship between the use of long-term debt and the market to book value of assets. Note that this is consistent with our earlier result that, for multiple bank firms, there is a positive relationship between market to book value and the use of bank debt.

We also reestimate these models again using the proportion of bank debt as the dependent variable, but also including as an explanatory variable the percentage of debt that matures in more than three years. The correlation between this debt maturity variable and the proportion of bank debt is negative and highly significant. The other results, however, are essentially unchanged.

V. Conclusions

There has been a considerable amount of research recently on the determinants of the choice of public versus private debt. Empirical research on this issue is limited in part because of the lack of detailed information on corporate debt structure in machine readable form. To examine the determinants of the mix of private and public debt, we have collected detailed information on the debt structure of 250 publicly traded corporations over the ten-year period 1980 to 1990.

Consistent with the theoretical work of Rajan (1992), we find that information monopolies associated with borrowing from a single bank lender limit the use of bank debt. Potential hold-up problems appear to be particularly acute for firms with substantial growth opportunities. Our results also suggest that multiple banking relationships or borrowing in public debt markets either mitigate these hold-up problems or indicate that bank information rents are lower.

Overall, our results are consistent with the widely held view that banks create durable transaction-specific information as part of an ongoing relationship. While this private information may have important benefits, it also can impose costs when borrowing is concentrated with a single borrower.

Our results are not necessarily inconsistent with prior studies that find significant benefits associated with relying on a single bank lender. For example, Petersen and Rajan (1994) find that, for small firms, borrowing from a single lender increases the availability of credit. For smaller firms without publicly traded common stock, the benefits of bank monitoring are likely to be large relative to the potential adverse incentive effects of information monopolies. In contrast, for publicly traded firms, the cost of establishing multiple banking relationships is likely to be considerably less than for small privately held firms. Moreover, given mandatory disclosure rules for publicly traded corporations, the benefits of more intense monitoring by a single lender may also be less. The threshold level of the information monopoly at which a firm chooses multiple borrowing relationships is therefore lower for larger firms.

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