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Michael Faulkender
Mitchell A. Petersen

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ABSTRACT

Empirical examinations of capital structure have led some to conclude that firms are under-levered. Implicit in this argument and much of the empirical work on leverage is the assumption that the availability of incremental capital depends solely on the risk of the firm's cash flows and characteristics of the firm. However, the same market frictions that make capital structure relevant suggest that firms may be rationed by lenders, leading some firms to appear to be under-levered relative to unconstrained firms. We examine this theory, arguing that the same characteristics that may be associated with firms being rationed by the debt markets are also associated with financial intermediaries, opposed to bond markets, being the source of a firm's debt capital. We find that firms have significantly different leverage ratios based on whether they have access to public bond markets as measured by the firm having a debt rating. Although firms with a debt rating are fundamentally different, these differences do not explain our findings. Even after controlling for the firm characteristics previously found to determine observed capital structure and the possible endogeneity of having a bond rating, we find that firms which are able to raise debt from public markets have 40 percent more debt.

Michael Faulkender
Olin School of Business
Washington University
aulkender@olin.wustl.edu

Mitchell A. Petersen
Kellogg Graduate School of Management
Northwestern University
2001 Sheridan Road
Evanston, IL 60208
and NBER
mpetersen@northwestern.edu

I) Introduction

Absent the assumption of Modigliani-Miller (1958), firms have an optimal capital structure. By calculating the tax advantages, costs of financial distress, mispricing, and incentive effects of debt versus equity, firms arrive at their optimal leverage ratio. The empirical literature has searched for evidence that firms choose their capital structure as theory predicts by estimating firm leverage as a function of firm characteristics. Firms for whom the tax shields of debt are greater, the costs of financial distress are lower, and the mispricing of debt relative to equity is smaller are expected to be more highly levered. When these firms find that the net benefit of debt is positive, they will move toward their optimal capital structure by issuing additional debt and/or reducing their equity. The implicit assumption has been that a firm's leverage is completely a function of the firm's demand. In other words, the supply of capital is infinitely elastic at the correct price and the cost of capital depends only upon the risk of the firm's projects.

Although the empirical literature has been successful in the sense that many of the proposed proxies are correlated with firms' actual capital structure choices, some authors have argued that some firms appear to be significantly under-levered. Based on estimated tax benefits of debt, Graham (2000) argues that firms appear to be missing the opportunity to create significant value by increasing their leverage and thus reducing their tax payments, assuming that the other costs of debt have been correctly measured.[1] This interpretation also assumes that firms have the opportunity to increase their leverage and are choosing to leave money on the table. Alternatively, firms may be unable to issue additional debt. The same type of market frictions that make capital structure choices relevant (information asymmetry and investment distortions) also imply that firms are sometimes

[1] Using a calibrated dynamic capital structure model Ju, Parrino, Poteshman, and Weisbach (2003) argue that firms are not under levered.

rationed by their lenders (Stiglitz and Weiss, 1981). Thus when estimating a firm's leverage, it is important to include not only determinants of its desired leverage (the demand side) but also variables which measure the constraints on a firm's ability to increase its leverage (the supply side).[2]

The literature has often described banks (or private lenders) as being particularly good at investigating informationally opaque firms and deciding which are viable borrowers. This suggests that the source of capital may be intimately related to firms' ability to access debt markets. Firms which are opaque (and thus difficult to investigate ex-ante) or which have more discretion in their investment opportunities (and thus difficult for lenders to constrain contractually) are more likely to borrow from active lenders and are also the type of firms which theory predicts may be constrained. In this paper we investigate the link between where firms obtain their capital (the private versus the public debt markets) and their capital structure (their leverage ratio). In the next section we briefly describe the tradeoff between financial intermediaries (the private debt markets) which have an advantage at collecting information and restructuring firms, but are a potentially more expensive source of capital, and arm's length lenders (the public debt markets). The higher cost of capital may be due to the expenditure on monitoring or because of the tax disadvantage of the lender's organizational form. Additionally, not all firms may be able to choose the source of their debt capital. If firms which do not have access to the public debt markets are constrained by lenders in the amount of debt capital they may raise, we should see this in their lower debt ratios. This is what we find in Section II. Firms which have access to the public debt markets (defined as having a debt rating) have leverage ratios which are fifty percent higher than firms which do not have access

[2] Titman and Wessels (1988) explicitly model a difference between the firm's desired leverage and their actual leverage. However, the difference is due to adjustment costs opposed to a limit on the abilities of firms to increase their leverage. The adjustment cost should not, therefore, lead to systematically low leverage relative to that predicted by theory.

(26.6 versus 17.0 percent).

Debt ratios should depend upon firm characteristics as well. Thus a difference in leverage does not imply that firms are constrained by the debt markets. This difference could be the product of firms with different characteristics optimally making different decisions about leverage. This, however, does not appear to be the case. In Section III we find that even after controlling for the firm characteristics which theory and previous empirical work argues determine a firm's choice of leverage, firms with access to the public debt market have higher leverage that is both economically and statistically significant. Finally, we consider the possibility that access to the public debt markets (having a debt rating) is endogenous in Section IV. Even after controlling for the endogeneity of a debt rating, we find firms with access to the public debt markets have significantly higher leverage ratios.

II) Empirical Strategy and the Basic Facts.

A) Relationship versus Arm's Length Lending.

In a frictionless capital market, firms are always able to secure funding for positive NPV projects. In the presence of information asymmetry in which the firm's quality, and the quality of its investment projects, can not be easily evaluated by the outside capital markets, firms may be unable to raise sufficient capital to fund all of its good projects (Stiglitz and Weiss (1981)). Such market frictions create the possibility for differentiated financial markets or institutions to arise. The theoretical explanation for financial intermediation has centered around this distortion (Leland and Pyle, 1977, Diamond, 1984, Fama, 1985, Haubrich, 1989, and Diamond 1991). Financial intermediaries are lenders that specialize in collecting information about borrowers which is then used in the credit approval decision. By interacting with borrowers over time and across different

products, the financial intermediary may be able to partially alleviate the information asymmetry which is the cause of the market's failure. The empirical literature has documented the importance of lending relationships in relaxing credit constraints (Hoshi, Kashyap and Scharfstein, 1990a, 1990b, Petersen and Rajan, 1994, and Berger and Udell, 1995).

Financial intermediaries (e.g. banks) may also have an advantage over arm's length lenders (e.g. bond markets) after the capital is provided. If ex-post monitoring raises the probability of success (either through enforcing efficient project choice or enforcing the expenditure of the owner's effort), then they may be a preferred source of capital (Diamond, 1991, Mester, Nakamura, and Renault, 1998). Financial intermediaries may also be better at efficient restructuring of firms which are in financial distress (Rajan, 1992, Bolton and Scharfstein 1996).

This intuition is the basis for the empirical literature which has examined firm's choice of lender. Firms which are riskier (more likely to need to be restructured), smaller, and about which less is known are the firms most likely to borrow from financial intermediaries (Cantillo and Wright, 2000, Faulkender, 2003, Petersen and Rajan, 1994). Larger firms, about which much is known, will be more likely to borrow from arm's length capital markets.

Monitoring done by financial intermediaries and the resources spent on restructuring firms, however, is costly. This cost must therefore be passed back to the firm and means that the cost of capital for firms in this imperfect market depends not only on the risk of their projects but the resources needed to verify the viability of their projects. Although the institutional response (the development of financial intermediaries and lending relationships) is able to partially mitigate the market distortions, it is unlikely that these distortions are completely eliminated. If monitoring is costly and imperfect, then two firms with identical projects, one of which needs to be monitored (for

example if the entrepreneur does not have a track record), will find that the cost of their (debt) capital is different. The cost of monitoring will be passed on to the borrower in the form of higher interest rates. This will cause the firm to reduce it use of debt capital. In addition, if the monitoring and additional information collection performed by the financial intermediary can not completely eliminate the information asymmetry, credit may still be rationed.

In this paper, we look for evidence that even among firms which have access to public capital markets (all the firms in our sample are publicly traded), and thus facing extensive disclosure requirements, there is still evidence of credit rationing, at least in the debt markets. The type of firms which are most likely to be affected by credit rationing are exactly the types of firms which theory and previous empirical work have suggested will tend to borrow from banks. Thus if we compare firms which are able to borrow from arm's length lenders (the bond markets) to those which can not, we may see evidence of credit rationing.

B) Data Source and Variable Definitions.

To examine the role of credit constraints and help explore the difference between the public debt markets (e.g. bonds) and the private debt market (e.g. banks), we examine the leverage of firms as a function of the firm's capital market access.[3] To the extent firms which do not have access to the public debt markets are constrained in the amount of debt which they may issue, we should see this in their leverage ratios, even after controlling for other determinants of capital structure. The firms we examine are publicly traded ones. Thus in theory, these should be less sensitive to credit rationing than the private firms which are the focus of some of the literature (Petersen and Rajan,

[3] Banks are a significant but not the only source of private debt capital. Other private lenders include finance, insurance, and leasing companies. These lenders may also specialize in monitoring of borrowers and their borrowers asset's, although the specifics of lending and monitoring may differ among the private lenders (see Carey, Post, and Sharpe, 1998).

1994, and Berger and Udell, 1995).

Our sample of firms is taken from Compustat for the years 1986 to 2000 and includes both the industrial/full coverage files as well as the research file. We exclude firms in the financial sector (6000s SICs) and the public sector (9000s SICs). We also exclude observations where the firm's sales or assets are less than $1M. Although Compustat (and the financial reports which the firms release) contains data on many characteristics of the firm's debt structure (maturity, priority, and security), it does not specify the source of the firm's debt. Thus, we are not able to directly measure whether the firm's existing debt is from a public or private source or whether the firm has access to the public debt markets. We use whether the firm has a debt rating as a proxy for whether the firm has access to the public debt markets. Compustat reports whether the firm has a bond rating or a commercial paper rating. If the firm has either (or both), we code the firm as having a public debt rating. Previous research on whether firms have access to the public debt markets has focused on small hand collected data samples to accurately measure the source of all of the firm's debt issuances (Cantillo and Wright, 2000, Houston and James, 1996). In these samples, the correspondence between having a debt rating and having public debt outstanding is quite high. Very few firms without a debt rating have public debt and very few of the firms have a debt rating but no public debt.[4]

In the next subsection, we analyze the firm's leverage as a function of its capital market access. The numerator of the debt to asset ratio includes both long term and short-term debt (including the current portion of long-term debt).We measure the debt ratio on both a book value

[4] "When a corporation is rated, it almost always has a positive amount of publicly traded debt: in the older data set (where they hand collected information on all debt), there are only 18 of 5529 observations (0.3%) where a company had a bond rating and no publicly traded debt and 135 observations (2.4%) where a firm had some public debt and no bond rating ." Cantillo and Wright, 2000.

and a market value basis. Thus the denominator of the ratio will be either the book value of assets or the market value of assets defined as the book value of assets minus the book value of common equity plus the market value of common equity. As a robustness test, we also use the interest coverage as an additional measure of the firm's leverage.

C) Rarity of Public Debt.

Even for public companies (firms with publicly traded equity), public debt is not common. Only 19 percent of the firms in our sample have access to the public debt markets in a given year, as measured by the existence of a debt rating (see Figure 1). Across the sample period, this average ranges from a low of 17 percent (in 1995) to a high of 22 percent (in 2000). These fractions may misstate the actual percentage of firms with access to the public debt markets. Some firms may not have a debt rating because they do not need or want debt capital. They may in theory have access to the public debt markets, but do not access it. When we condition on having debt, the percentage of firms having a debt rating rises, but to only 21 percent. Either measurement, however, reaches the same conclusion – public debt is a rare source of capital for most public firms.

The importance of public debt is greater if we look at the fraction of dollars of debt which are public opposed to the fraction of firms which use public debt markets. The public debt markets are large. According to the Federal Reserve flow of funds data, total public debt was $2.6 trillion in 2000. The total debt of firms in our sample with access to the public debt market is $2.9 trillion, or about 11 percent more than the total public debt number.[5] Thus if we look at the fraction of debt dollars which are issued by firms with a debt rating, we find that 78 percent of debt is issued by

[5] To calculate the 2.9 trillion number, we added up the total debt of all firms with a debt rating. Since some of the firms with a debt rating may also borrow from private sources, the total debt of firms with a debt rating overstates their public debt. Over our sample period (1986-2000) the total debt of firms with a debt rating averages 109 percent of the flow of funds public debt number.

firms with a debt rating (see Figure 1). Most of the debt of public firms is public debt. Despite the large aggregate size of the market, however, public debt is a relatively rare source of capital for most firms, even most public firms.

D) Debt Market Access and Leverage.

Traditional discussions of optimal capital structure (e.g. static trade off theory) usually assume that firms can issue whatever form of securities they wish with the pricing conditioned on the risk of the security. However, in this paper we first document that the source of the firm's debt, whether it has access to the public debt markets, has a strong influence on its capital structure choice. To measure the importance of capital market access we compared the leverage of the firms which have access to the public debt markets (have a debt rating) to those which do not. Independent of how we measure leverage, we see that firms with debt ratings have leverage which is significantly higher than firms without a debt rating (see Table I-A). If we measure leverage using market debt ratios, the firms with a debt rating have a debt ratio that is higher by almost 10 percentage points. These firm's average debt ratio is 26.6% versus 17.0% ($p<0.01$).When we examine debt ratios based on book values, the difference is slightly larger – 37.2 versus 23.5 percent ($p<0.01$).[6] These are large differences in debt. For firms of equal size, a debt rating increases the firm's debt by 56 percent ((26.6-17.0)/17.0).

The difference in leverage is very robust. We see the same pattern across the entire

[6] The book debt ratios for some of the firms are extremely high. To prevent the means from being distorted by a few observations, we recoded the book debt ratio to be equal to one if it was above one. 1.3 percent of the book value ratios were recoded this way. The recoding moves the mean of the entire distribution from 26.9 to 26.1%, which is closer to the median of 23.1%. The difference in leverage between the two samples (with and without bond market access) does not change. Houston and James report the leverage ratio (debt over book assets) for their sample of 250 firms divided by whether the firms have public debt outstanding or not. The higher leverage for firms with public debt can be seen in their Table V (47 versus 34%), but the paper doesn't note this finding .

distribution. The firms with a debt rating have higher leverage at the 25th, 50th, and 75th percentile of the distribution (see Table I-A). For the median firm, having a debt rating raises the market value debt ratio by 13.0 percentage points (from 11.4 to 24.4) and the book value ratio by 15.7 percentage points. Both changes are statistically significant ($p<=0.01$) as well as economically large. The higher leverage of the firms with public debt appears in each year of our sample period as well (1986-2000). The difference between the market value debt ratio of firms with and without a debt rating varies from 5.5 to 12.2 percent across years (or 7.2 to 18.7 percent for book value ratios). The difference is always statistically significant.

Some of the firms in our sample have zero debt. These firms may be completely credit rationed by the debt markets. Alternatively, they may have access to the (public) debt markets but have chosen to finance themselves only with equity. If they do not want debt capital, there is little reason for them to obtain a debt rating. Thus the low debt ratios for firms without a debt rating may be the result of firms which do not want any debt having chosen not to have a debt rating. To check this, we recalculated the average debt ratios including only firms which have debt. As can be seen in Table I-B, the results do not change dramatically since a small fraction of firms have zero debt (10 percent of the firm years in our sample). The debt ratios for firms with a debt rating rise very slightly, while the debt ratios for the firms without a debt rating rise by two to three percentage points.[7] We still find that firms with access to the public debt markets have significantly more debt – 7.3 percentage points higher market debt ratio or 37 percent more debt (7.3/19.5).

Throughout the paper we use whether the firm has a debt rating as a proxy for whether it has access to the capital market. We find that firms with access have significantly greater leverage.

[7] There are 48 firm years and 33 distinct firms in our sample, where the firm has a debt rating but zero debt.

However, if our proxy is an imperfect measure of market access (e.g. firms without a debt rating for example actually have access to the public debt markets), then our estimates of debt ratios across the two classifications will be biased toward each other. Some of the firms that have access to the public debt markets, but do not have a debt rating, will be incorrectly classified as not having access to the public debt markets.[8] The incorrect inclusion of these firms in the sample of firms without market access will bias the debt ratio of this group up. For the sample labeled as having debt market access, the bias in the debt ratio will be downward. Thus our estimated differences will be smaller than the true difference.

III) Empirical Results: Causes and Implications.

A) Differences in Firm Characteristics.

Now that we have documented that firms with access to the public debt markets (have a debt rating) are more highly levered, this raises the question of why this is true and what it means. One set of firms having more debt than another could be driven by either demand or supply considerations. It may be that the type of firms that have access to the public debt market are also the type of firms which find debt more valuable. For such firms the benefits of debt (e.g. tax shields or contracting benefits) may be greater and/or the costs of debt (e.g. financial distress) may be lower. This has been the view taken by much of the empirical capital structure literature. Although Modigliani-Miller irrelevance does not hold on the demand side of the market, it is assumed to hold on the supply side. The supply of capital is infinitely elastic at the correct price and the price of

[8] For example, since our data comes from Compustat only firm's with a debt rating from S&P are classified as having a bond rating. Firms with a rating only from Moodys and/or Fitch will be incorrectly classified as not having a bond rating. Based on our discussions with the ratings agencies, the magnitude of this mis-classification should be small.

capital is independent of its source or the form of the debt security issued.[9] Our univariate results can not distinguish between demand side (by firm characteristics) and supply side considerations (the firms without access to public debt are constrained in their ability to borrow).

To determine why our firms with access to the bond market are more leveraged, we must first determine how the two samples of firms are different and whether this difference explains the difference in leverage we found in Table I. Based on the firm characteristics examined in the literature on optimal capital structure, we find that firms which have a debt rating are clearly different than firms which do not (e.g. Titman, and Wessels, 1988, Barclay and Smith, 1995b, Graham, 1996, Graham, Lemmon, and Schallheim, 1998, Hovakimain, Opler, and Titman, 2001). First, the average size of issues in the public debt market is larger and the fixed costs of issuing public bonds are greater than in the private debt markets. Consistent with this, the firms with a debt rating are appreciably larger (see Table II). Whether we examine the book value of assets, the market value of assets, or sales, firms with a debt rating are about 300 percent larger (difference in natural logs) than firms without a debt rating ($p<0.01$). The firms with a debt rating also differ in the type of assets upon which their businesses are based. These firms have more tangible assets in the form of property, plant, and equipment (42 versus 31 percent of book assets, see Table II), are significantly older, but spend less on research and development (1.8 versus 6.1 percent of sales). They also have smaller mean market to book ratios, suggesting fewer intangible assets such as growth opportunities (Myers, 1977).

As previous work has noted, the maturity of a firm's debt is also correlated with the source

[9] The literature which has examined firm's choice of maturity (Guedes and Opler, 1996, Barclay and Smith, 1995a, Johnson, 2003, Stohs and Mauer, 1996), priority (Dennis, Nandy, and Sharpe, 2000, Barclay and Smith, 1995b) or choice of lender (Cantillo and Wright, 2000, Johnson, 1997, Gilson and Warner, 2000, Krishnaswami, Spindt, and Subramaniam, 1999) obviously focuses on the cost and benefits differing across the type of (debt) security.

of the debt. Maturities in the bond markets tend to be greater than those of the private (bank debt) market (Barclay and Smith, 1995a). From its reported balance sheet, we don't know the exact maturity of each firm's debt, but we do know the amount of debt due in each of the next five years. The percentage of debt due in one to five years plus the percent of debt due in more than five years is reported in Table III. As expected, those firms with a debt rating have significantly longer maturities. They have an average of 59 percent of their debt due in more than five years compared to only 28 percent for firms without a debt rating ($p < 0.01$). Firms with a debt rating have only 17 percent of their debt due in the next year compared to 37 percent for firms without a debt rating ($p < 0.01$). The difference in maturity is centered around year four. Firms without a debt rating, have 60 percent of their debt due in the next three years and only 34 percent due in years five and beyond. Firms with a debt rating have only 28 percent of their debt due in the next three years, but have 65 percent due in years five and beyond.

Given the firm characteristics reported in Tables II and III, we should not be surprised that firms with a debt rating have higher leverage ratios. They have the characteristics that previous research has found to be correlated with higher leverage ratios. Thus if we want to argue that having a debt rating has an independent effect on a firm's leverage it is essential that we control for firm characteristics which drive its leverage choice.

B) Demand Side Determinants of Leverage.

In this section we regress the firm's leverage (debt to market value of assets) on a set of firm characteristics and whether the firm has a debt rating. The firm characteristics are intended to control for demand factors (the relative benefits and costs of debt), with any remaining variability which is explained by the debt rating variable measuring differences in access to capital (i.e. supply). The

variables we include measure the size of the firm, its asset type, its risk, and its marginal tax rate.[10] We examine supply side variability directly in section IV when we use an instrumental variables approach.

We start with asset type and follow the literature in our choice of variables. Firms which have more tangible, easy to value assets, are expected to have lower costs of financial distress. We use the firm's property, plant, and equipment to asset ratio as a measure of the firm's asset tangibility (Titman and Wessels, 1988, and Rajan and Zingales, 1995). On the opposite end of the spectrum, investments in brand name and intellectual capital may be more difficult to measure. We use the firm's spending on research and development and advertising scaled by sales as a measurement of the firm's intangible assets (Mackie-Mason, 1990, and Graham, 2000). We also include the firm's market to book ratio as an additional control for firm's intangible assets or growth opportunities (Hovakimian, Opler, and Titman, 2001, and Rajan and Zingales, 1995).

Our findings mirror the previous work on leverage. Increases in the tangibility of assets raises the firm's debt ratio (see Table IV). Moving a firm's ratio of property, plant, and equipment to assets from the 25th (14%) to the 75th percentile (49%), raises the firm's debt ratio by 5.7 percentage points ($p<0.01$). Increases in the firm's intangible assets lowers the firm's debt to asset ratio. Moving a firm's research and development expenditure (scaled by sales) from the 25th to the 75th percentile, lowers the firm's leverage by a half of a percentage point ($p<0.01$). The economic significance of variability in a firm's advertising to sales ratio is even smaller. Part of the reason

[10] Each regression also includes a full set of year dummies. Although the increase in explanatory power from year dummies is not large, the R^2 increases from 0.248 to 0.257 (Table IV, column I); they are jointly statistically significant (p-value<0.01). In addition, the year to year variability is not trivial. The coefficients range from a low of -2.2 (1993) to a high of 3.2% (1990) relative to the base year of 1986.

these ratios have a smaller impact is that part of the effect is picked up by the market to book ratio. Dropping the market to book ratio from the regression increases the coefficient on research and development significantly. We also find that more profitable firms (EBITDA/Sales) have lower leverage (Titman and Wessels, 1988, and Hovakimian, Opler, and Titman, 2001). Profitable firms tend to use their earnings to pay off debt and thus have lower leverage.

Historically leverage has been found to be positively correlated with size (Graham, Lemmon, and Schallheim, 1998, Hovakimain, Opler, and Titman, 2001). Graham, Lemmon and Schallheim (1998) argue that larger firms are lower risk/more diversified and thus the probabilities of distress and the expected costs of financial distress are lower. They may also have lower issue costs (because of economies of scale) which would suggest they have higher leverage. In our sample, however, we find that larger firms are less levered, and the magnitude of this effect is not small. Increasing the market value of the firm from \$40M (25th percentile) to \$871M (75th percentile) lowers the firm's leverage by almost three percentage points ($p<0.01$).[11]

The question is why we find such different results. One possibility is the positive correlation between a firm's size and whether it has a debt rating ($\rho = 0.60$). However, even when we drop having a debt rating from the regression, the coefficient on size is slightly negative ($\beta = -0.000$, t=-0.4, regression not reported). The difference between our results and previous work is two fold. First, the dependent variable we examine is total debt to assets, whereas some of the previous papers looked at long-term debt to assets (e.g. Graham, Lemmon, and Schallheim, 1998). If we used long-term debt to assets and re-ran the regression without the debt rating variable, then the coefficient on

[11] To test that we have the functional form correctly specified, we replaced the log of market value of assets with 20 dummy variables, one for each of the 20 vigintiles. The R^2 increased by only 0.001 and the estimated coefficient on the 20 dummy variables essentially lie along a straight line implying leverage is linear in the log of market value of assets.

size becomes positive and is similar in magnitude to prior findings ($\beta = 0.009$, $p<0.01$, regression not reported).[12] Including the debt rating dummy, causes the size coefficient to shrink to zero ($\beta = 0.000$, regression not reported), consistent with the intuition that only the largest firms having debt ratings because of economies of scale in the bond markets (see Table II and Section IV below). The second difference is we include only firm-years which report positive debt. If we include all observations and re-ran the regression without the debt rating variable, then the coefficient on size is again positive ($\beta = 0.004$, $p<0.01$, regression not reported). Including the debt rating variable, turns the coefficient on size negative again and leads to a slightly larger coefficient on having a debt rating for the reasons discussed above (0.078 versus 0.073 in Table IV, column I).[13]

Before returning to the effect of having a debt rating, we want to consider three other variables which have been used less consistently in the literature to explain differences in leverage. First, firms with higher marginal tax rates prior to the deduction of interest expenditures should have higher values of their interest tax shield and thus have more leverage. The empirical support for this idea, however, was weak until Graham devised a way to simulate the marginal tax rate facing a firm prior to its choice of leverage (Bradley, Jarrell, and Kim, 1984, Fisher, Heinkel, and Zechner, 1989, Scholes, Wilson, and Wolfson, 1990).[14] When we include the simulated marginal tax rate, we find

[12] This difference is also consistent with previous work on debt maturity. Barclay and Smith (1995a) find that larger firms have longer maturity debt. Together these results imply that large firms have more long-term debt, and less short-term debt.

[13] We calculate White heteroscedastic consistent errors, corrected for possible correlation across observations of a given firm, in all of the regressions. Since the residuals for a given firm are correlated across different years (see discussion below) the normal OLS standard errors are understated. For example, the OLS t-statistic on having a bond rating is 39.6, but the t-statistic based on the corrected standard errors is 17.7.

[14] The marginal tax rates are provided by Graham and are based on pre-interest income. They are calculated following the method outlined in Graham (1996) and Graham, Lemmon, and Schallheim (1998). As described in Graham (2000), "these tax rates vary with the firm-specific effects of tax-loss carrybacks and carryforwards, investment tax credits, the alternative minimum tax, nondebt tax shields, the progressive statutory tax schedule, and earnings uncertainty."

a negative, not a positive, coefficient. The difference between our results and previous work may again be driven by our definition of the debt ratio. When we use long-term debt to market value of assets as a dependent variable the coefficient on the simulated marginal tax rate is positive, large, and statistically significant ($\beta = 0.036$, t=3.8, regression not reported).

Firms with more volatile assets will have higher probabilities of distress and expected costs of distress. These firms are expected to choose lower leverage. They are also more likely to go to banks, opposed to the public capital markets, to obtain financing (Cantillo and Wright, 2000). We measure the volatility of the firm's assets by estimating the volatility of its asset return as the equity volatility of the firm over the previous year times the equity to asset ratio.[15] We also include the previous year's equity return to account for partial adjustment in the firm's debt to asset ratio (Korajczyk, Lucas, and McDonald, 1990, Hovakimain, Opler, and Titman, 2001, Welch, 2003). If the firm does not constantly adjust its capital structure, then following unexpected increases in its asset value (equity value), we will see the firm delever. We see both effects in Table IV. Firms whose equity, and presumably asset value, has risen over the past year, have lower leverage. The

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[15] The actual formula for asset volatility is:

$$\sigma_A = \sqrt{\left(\frac{E}{A}\right)^2 \sigma_E^2 + \left(\frac{D}{A}\right)^2 \sigma_D^2 + 2\left(\frac{D}{A}\right)\left(\frac{E}{A}\right) \rho\, \sigma_D\, \sigma_E} \qquad \textbf{(1)}$$

Thus our estimate of asset volatility understates the true asset volatility. A more significant problem is the magnitude of the error is increasing in the debt to asset ratio. For an all equity firm, our estimate is correct. This type of measurement error will bias our coefficient away from zero. To estimate the magnitude of the bias, we estimated the true asset volatility using a Merton model as was used by Ronn and Verma (1986).

$$\sigma_A = \frac{\frac{E}{A}\,\sigma_E}{\Delta(\sigma_A)} \qquad \textbf{(2)}$$

When we re-estimated the model using this estimate of the asset volatility the coefficient on the asset volatility was slightly closer to zero and the coefficient on having a rating was slightly larger.

magnitude of this effect is tiny. A 59 percentage point increase in equity values (the interquartile range) lowers the firms leverage by only 20 basis points. The effect of asset volatility is much larger. A 31 percentage point increase in asset volatility (the interquartile range) lowers leverage by 10 percentage points ($p<0.01$).

The purpose of including the firm characteristics is to determine if the difference in leverage between firms with and without a debt rating arose because of fundamental differences in the firms, and thus their demand for leverage. The firms are clearly different (Table II), and these variables do explain a significant fraction of the variability in debt ratios across firms and across time (Table IV). However, even after the inclusion of the firm characteristics, firms with a debt rating are consistently more levered ($p<0.01$) and the reduction in the coefficient on having a rating is relatively small (7.3 percent in Table I to 6.8 percent in Table IV, column III).[16]

As discussed above, firms with a debt rating issue bonds which tend to have longer maturities and those without a bond rating borrow from the private debt markets and these loans have shorter maturities (see Table III). We know from Barclay and Smith (1995a) that leverage and maturity are correlated (see also von Thadden, 1995, for a theoretical justification). To verify that our measure of bond market access is not just proxying for maturity, we include the fraction of the firm's debt which is due in one year or less and the fraction of the firm's debt that is due in more than five years. This does not imply that maturity is chosen first and then leverage is chosen; they

[16] We replicated Table IV using the ratio of debt to the book value of assets. Across the models, firms which have a debt rating have leverage which is 11.9 to 12.9 percentage points higher ($p<0.01$). This compares to the univariate difference of 13.7 percent (Table I). We also estimated Table IV using net debt (debt minus cash and marketable securities) as the dependent variable. The coefficients on having a debt rating become larger. For example, the coefficient on having a rating rises from 6.8% (Table IV, column III) to 7.1% when we used net debt. Thus firms without access to the bond market not only have less debt, but they also hold more cash. (see Opler, Pinkowitz, Stulz, and Williamson, 1999 for evidence that firm's with a bond rating hold less cash). Finally, we estimated Table IV using debt plus accounts payable as the dependent variable. Again the coefficient on having a rating rises slightly from the 6.8% we report in column III to 7.1% when we include accounts payable as debt.

are most likely a simultaneous decision. The purpose of this regression is to verify that the two effects (debt rating and maturity) are distinct effects. We find that they are. As expected, maturity is correlated with leverage. Firms that have less short-term debt (due in one year) and more long-term debt (due in more than five years) have greater leverage (see Table IV, column VI). A firm which changed its debt maturity from all due in one year to all due in more than five years would raise its predicted debt ratio by 4 percentage points. Even after controlling for maturity, however, we find that firms with a debt rating have significantly more debt ($\beta = 0.063$, $t=16.2$).[17]

To verify that our results are not driven by a few years, we re-estimated our model (Table IV, column III) allowing the coefficient on having a rating to vary by year (i.e. we interacted the year dummies with the firm has a debt rating variable). We have graphed the debt rating coefficients against time in Figure 2. There are several things to note. First, there is variation in the effect of having a rating, although the coefficient is always significantly greater than zero. The rating coefficient varies from a low of 5.3% in 1991 (meaning firms with a debt rating have a leverage ratio which is 5.3% higher than an otherwise identical firm) to a high of 8.6% in 1998. The variability in the coefficients is also statistically significant ($F\text{-stat}(14,60438) = 3.76$, $p\text{-value}<0.01$). Although there is variability in the coefficients, it does not rise or fall systematically over the sample period. The effect of having a bond rating is low during the 1990/1991 recession, but this effect seems to both pre- and post-date the recession. In addition, if the recession was associated with a banking

[17] The finding that firms with access to the bond market have greater leverage could be a direct quantity effect or could operate through the price mechanism. If debt capital is more expensive in the banking market, for example to cover the cost of ex-ante investigation and ex-post monitoring, then a firm with access to the bond market would choose higher leverage than an otherwise identical firm which did not have access because they have access to cheaper debt (by assumption). The only measure of debt cost available to us is the average interest rate paid by the firm during the year (interest expense divided by the average of beginning of year and end of year debt levels). When we regress this measure on our firm characteristics and whether the firm has a debt rating, the coefficient is positive, not negative, suggesting that debt capital is more expensive in the bond market. However, given the quality of the interest rate data and since other authors have more accurate data, these results should be interpreted with caution.

credit crunch (as discussed in Bernanke and Lown, 1991), we would have expected the coefficient to rise during the recession as bank dependent firms have less access to debt capital, they would be increasingly under-levered relative to firms with access to the bond market.

C) Industry and Firm Fixed Effects.

Since many of the benefits and costs of debt depend upon the production process, the firm's industry may be useful in predicting its leverage. Our estimates thus far have ignored the panel structure of our data (except for our adjustment of the standard errors). However, by estimating the effect of having a debt rating from both within variation (deviations from industry means) and between variation (differences between industry mean), we can test the robustness of our findings. By including industry dummies (the within estimates), we can completely control for any determinant of leverage that is constant within an industry and verifying that having a debt rating is not just a proxy for industry. We report both results in Table V. The results are qualitatively similar to the previous results. The effect of debt rating on leverage falls slightly (from 6.8% - Table IV, column III to 5.9% - Table V, column I) when we include controls for each of the 397 industries (four digit SIC) in our sample. When we instead run the regression on industry means, the coefficient is larger (11.0%).

A finer robustness test is to estimate the between and within estimates based on firm, as opposed to industry, variation. In this specification, having a bond rating can not be a proxy for any unobserved firm specific factor which influences the firm's demand for debt. Once we include a dummy for each firm in the sample, the coefficient on a firm having a debt rating does drop to 4.6%, but it is still large, both economically and statistically (see Table V, column III). Although the estimated coefficient is based only on those firms whose rating status changes during the sample

period, which comprise approximately 15.5 percent of the firms in our sample, it matches closely the results in Table IV. When we include firm specific dummies in the regression, we are able to explain a significant fraction of the variability in firm's leverage (80%), and after controlling for all the factors, we still find that firms with access to the debt markets are significantly more levered.

Given the inclusion of a firm specific dummy in the regression, constant unobserved firm characteristics can not explain our results. It may be possible, however, that in unobserved ways, a firm's demand for debt slowly rises over the sample period. If the firm also obtains a rating during the sample period, this would induce a spurious correlation between having a rating and leverage. To test this hypothesis, we estimate a first difference version of the model (see Table V, column V). If over the sample period, demand for debt is rising in unobservable ways, then the estimate in column III (within estimates) will be much larger than the estimates in column V (first difference estimates). Remember, the within estimates are based on the difference in the average debt ratio in years the firm had a debt rating versus the average debt ratio in years in which it does not. This isn't what we find. The first difference coefficient (3.7%) is almost as large as the within estimate (4.6%). Thus our finding could only be driven by unobserved demand factors if these factors are constant across time but then change dramatically in the year the firm obtains a debt rating.[18] We read the 10Ks of firms the year before and after they obtained a debt rating and found no evidence of such dramatic changes in the firm's characteristics.

[18] An example may help illustrate this point. Take an example where the firm's desired leverage ratio rises one percentage point per year over the ten year sample period (the straight line in Figure 3), the firm obtains a debt rating in year 6, and maintains it for the rest of the sample. The within estimate is the difference between the average leverage in years when the firm had a rating (years 6-10) and years in which it did not (years 1-5). The within coefficient is 5 percent in this case and is the difference between the level of the squares (22%-17%). The difference coefficient is the difference between the debt ratio the first year the firm has a debt rating and the debt ratio the prior year (the diamonds in Figure 3). The difference coefficient is 1% (20%-19%). Since the change in the desired debt ratio (the line) is slow, the difference coefficient is only 20% of the within coefficient (0.20 = 1%/5%) compared to a ratio of 81% in our data (3.7/4.6).

D) Interest Coverage

Most of the literature on leverage has focused on debt to asset ratios as a measure of leverage, however, some authors have argued that interest coverage is an alternative measure of leverage (Andrade and Kaplan, 1997). For a mature firm with low expected growth, measuring leverage by debt to asset ratios or interest coverage ratios will lead to similar conclusions. However, firms whose cash flows are expected to grow rapidly can appear to have low leverage when measured on a debt to asset ratio basis (low debt relative to large future expected cash flows) but highly levered when measured on an interest coverage basis (large required interest payments relative to current cash flows). Since having a bond rating is correlated with firm age and the market to book ratio and thus may be correlated with growth (see Table II), we want to verify that our findings are robust to how leverage is measured. To do so, we re-estimate our leverage regressions using interest coverage (operating earnings before depreciation over interest expense) as the dependent variable. Since an increase in coverage from 100 to 101 is not as large as an increase from 1 to 2, we take the log of one plus interest coverage as our variable of interest. This also has the advantage of making the distribution more symmetric. An additional problem occurs when earnings are negative since the interest coverage ratio is not well defined in these cases. To solve this problem, we code interest coverage equal to zero when earnings are negative and then account for this truncation in the estimation procedure by estimating a tobit model with a lower limit of zero (which translates into interest coverage of zero).[19]

The intuition we found based on debt ratios is replicated with interest coverage, although the

[19] We also checked that the truncation point did not materially change our estimates. When we set the lower limit on income to be -0.5 times interest expense, an interest coverage of -0.5 instead of 0.0, the coefficient on having a debt rating rises slightly in absolute value from -0.564 (Table VI, column II) to -0.658 (column V).

magnitudes are larger. Firms that have access to the public debt market have significantly lower interest coverage (i.e. are more levered). Since the dependent variable is logged, the coefficient can be interpreted as percent changes in interest coverage. A firm with a debt rating has interest coverage which is 65 percent lower than an otherwise identical firm (see Table VI, column I). The magnitude of this effect remains unchanged as we add the additional control variables (see Table VI, columns II-IV).

IV) Determinants of a Firm's Source of Capital.

A) Who Borrows from the Bond Market.

In this section we examine which firms have access to the public bond market. This is useful for two reasons. First, a firm's source of capital is part of its capital structure decision and the theoretical literature has hypothesized why some types of lenders (active monitors such as banks) developed to cater to certain types of firms (informationally opaque firms). Thus far, however, there has been little empirical work describing why some firms either choose to, or are allowed to, borrow from the bond market while others rely exclusively on private lenders such as banks (see Cantillo and Wright, 2000, Sunder, 2002). Thus, understanding how firms and lenders are matched is an independently interesting question.

We are also interested in the determinants of bond market access to control for the possible endogeneity of a firm having a rating. In the previous section, we tried to disentangle the firm's demand for debt capital from the supply of debt capital available to the firm. We did this by controlling for firm characteristics which determine the net benefit of debt (including industry and firm dummies) and thus the firm's demand for debt. The implicit assumption in the previous results is that having a bond rating is exogenously determined. Firms whose assets are mainly tangible (high

property, plant and equipment to total asset ratios) are more likely to have a bond rating (see Table II) and also choose to have higher leverage ratios (Table IV). If there are other such variables, which we do not observe, then our coefficient could be biased. To address this potential problem, we re-estimated our model using an instrumental variables approach.

The first stage in instrumental variables estimation is to estimate the endogenous variable (whether a firm has a bond rating) as a function of the exogenous variables in the second stage plus additional instruments. The instruments capture the variation in who has access to the bond market or supply side factors. We report the first stage results in Table VII. The first thing to notice is that the firm characteristics which are correlated with higher leverage ratio are also associated with having a bond rating. Older firms, firms with more tangible assets, and firms with lower volatility assets are all more likely to have access to the public bond markets. Although each of these effects is statistically significant ($p<0.01$), the economic magnitude of the effects does differ (see Table VII, column I). Increasing a firm's property, plant and equipment to total asset ratio from the 25th percentile (14%) to the 75th percentile (49%) raises the probability of having a bond rating by only 1.4%; whereas lowering a firm's asset volatility from the 75th percentile (46%) to the 25th percentile (15%) raises the probability of having a bond rating by 9.8%.[20] The variable with the largest economic impact is the size of the firm. Raising the market value of the firm's assets from the 25th percentile to 75th percentile, raises the probability of having a bond rating by 26 percentage points (from 3 to 29%). This is consistent with a large fixed cost of issuing public bonds relative to bank

[20] To calculate estimated probabilities, we set all variables equal to their actual value except for the value of interest (e.g. asset volatility). We then set this variable equal to its 25th percentile of the distribution for all firm-years in the sample and calculate an average probability of having a bond rating based on our model. We next set the variable of interest to the 75th percentile of the distribution for all firm-years in the sample and calculate a second average probability. The difference between these two averages is the estimated change in probability.

debt as well as a minimum critical size for a bond issue to be viable (liquid). We will return to this issue below.

To obtain instruments, we need variables that are correlated with whether a firm has a bond rating, but uncorrelated with the firm's desired level of leverage (i.e. the net benefit of debt). To start the search we spoke with the investment banks that underwrite the debt issues and the rating agencies that rate the debt.[21] One of the first characteristics we searched for is how well known or visible the firm was. We were told that the less the banks had to introduce and explain a new issuer to the market, the more likely a public bond issue (and thus a debt rating) would be. As measures of whether the firm is widely known to the markets we used two variables: whether the firm is in the S&P 500 Index and whether the firm's equity trades on the NYSE. S&P includes firms in the index to make it representative of the important industries in the economy, not based on the value of the debt tax shield or the costs of financial distress, making it a good candidate for an instrument. Where a firm's stock is traded may affect its equity prices, but since it can raise a firm's visibility, it also makes a good potential instrument. Both variables are positively correlated with having a debt rating and the relationship is statistically significant (Table VII, column II, $p<0.01$).[22] The economic impact of being included in the S&P 500 is however larger (raising the probability of having a bond rating by 10%) than the economic impact of moving a firm's equity trading venue to the NYSE (raising the probability of having a bond rating by 2%).

[21] In theory either or both institution could be the gate keeper to the public bond markets. We were told by members of both institutions that the investment banks act as the predominant gate keeper. If a bank feels that it can place a firm's bonds in the market, then the firm secures a rating. If the banks feel that they can not place the bonds, there is no reason to secure a rating.

[22] If the instruments are only weakly correlated with the endogenous variable, then IV estimates will be biased toward the OLS estimates (Staiger and Stock, 1997). To verify that this was not a problem, we calculated the F-statistic for the hypothesis that all instrument coefficients are zero (see Table VII). Since the F-statistics are large and statistically significant, the IV estimates should be unbiased.

The probability of having public debt is also related to how unique the firm is. A new firm which manufactures autos will be able to issue bonds more easily, since the bond market already knows the industry and the competitors, as more auto manufacturers have outstanding public debt (Ben Dor, 2003, finds similar results in the IPO market). This lowers the costs of investigating the new public debt issue. Alternatively, a firm for whom there are no comparable firms with outstanding bonds will find issuing bonds more difficult, since the bankers must start from scratch to explain the firm and its industry to the market. In such a case, we have been told that the likelihood that a bank would be willing to underwrite a bond issue is lower. To empirically test this effect, for each firm year, we calculate the percentage of firms in the same three digit industry as the firm which have a bond rating, excluding the firm. The log of one plus this percentage is included as an additional instrument.[23] Consistent with our hypothesis, if more firms in your industry have a bond rating, this raises the probability of your firm having a debt rating (see Table VII, column III, p=0.045).[24] Raising the fraction of other firms in your industry with a bond rating (i.e. lowering the costs of collecting information for a bond underwriting) from zero to one raises the probability of having a bond rating by 3.4%. As a robustness check, we also calculated the probability using the market value of each firm's assets as weights (Table VII, column IV). Thus the probability is the fraction of assets, excluding the firm's assets, which are from firms with a public bond rating. The

[23] We use the log of the probability, opposed to the actual probability, since we expect the marginal effect of increases in the probability to decline (e.g. raising the fraction of firms in the industry with a rating from 0 to 10% is expected to have a greater effect than raising the probability from 50% to 60%). The data confirms this intuition. When we replace the log of the probability with the probability, the coefficient drops from 0.307 to 0.192 and the t-statistic drops from 2.0 to 1.6.

[24] This variable is correlated with industry but it is not a simple proxy for industry. Remember, when we included dummy variables for each industry at the 4 digit level, the coefficient on having a bond rating remained economically large and statistically significant (Table V, column I). We find a similar result if we include dummy variables for each three digit industry in Table VII (regression not reported).

coefficient on this variable is also statistically significant, but the magnitude is smaller (2.0% versus 3.1%).

As a firm ages it becomes better known to the market and this can expand its access to capital (see Table IV, Berger and Udell, 1995, and Petersen and Rajan, 1994). However, until a firm has a sufficient track record, it may not be able to access the public debt markets. While private debt providers often have built relationships with firms before they go public, this is less common for the public debt markets (Schenone, 2002). To capture this idea we included a dummy variable for whether the firm was three years old or younger (see Table VII, column V). We find that these firms are less likely to have a debt rating, but the economic size of the effect is small (1.4%) and is less significant statistically than the other instruments (p=0.074).

For our final instrument, we return to our previous result that size is the strongest predictor of which firms have a debt rating. This is consistent with issuing bonds having a large fixed cost. It is also consistent with the market requiring a minimum amount of outstanding bonds to create a liquid market. Unlike equities, the bond market is essentially an institutional market and thus the minimum required size of an issue is probably much larger. A requirement for inclusion of a bond issue in the Lehman Brothers Corporate Bond Index is that the amount of a firm's outstanding bonds must exceed a minimum threshold.[25] Thus we created a dummy variable which is equal to one if the firm is too small to issue a public bond large enough to be in the Lehman Corporate Bond Index. The

[25] We collected the components of the Lehman Brothers Corporate Bond Index for the years 1990 through 2000 and then used the data to calculate the minimum required size of a bond issue to be included in the index. The amounts specified in the components of the index are the total par amount outstanding for index-eligible bonds (i.e. no floaters or maturities shorter than one year). For the years prior to 1990, we relied on the documentation for the Index. The minimum bond issue size is: 1M (1986-1988), 50M (1989-1992), 100M (1993-1998), and $150M (1999-2000). When we used only the years for which we have the actual components of the Bond Index (1990-2000), the coefficient on the instrument is slightly larger (β=0.464, t=7.6).

variable is defined as equal to one if the size of the firm (the market value of assets) times 0.173 (the median debt ratio from Table I-B) is less than the minimum required bond issue size. Firms that are large enough to issue public bonds and have them included in the index have a 7.1% higher probability of having a bond rating (Table VII, column VI).

B) Instrumental Variables Estimates.

To examine the importance of the bond rating being endogenous, we estimated our leverage equations using the instruments discussed above. The results are reported in Table VIII. The first column contains OLS estimates (from Table IV, column III) for comparison, while the remaining columns are the instrumental variable estimates based on the instruments and the first stage estimation from Table VII.[26] Instrumenting for having a bond rating does lower the estimated coefficient from the original 0.068, however, the estimated coefficients are still large. Depending upon the instruments used, having a bond rating raises the leverage of the firm by between 6.1 and 6.7% ($p<0.01$).[27]

V) Conclusion.

In this paper we examine how firms choose their capital structure. By combining the literature on optimal choice of leverage with the literature on credit constraints, we are able to better explain the observed patterns of leverage seen in publicly traded firms. When examining small,

[26] Since the dependent variable in the first stage is a binary variable, standard instrumental variables estimation will not work in our case. It assumes the first stage is a linear probability model, which is miss specification of the data. Instead we estimated a probit as the first stage (Table VII). We then used the predicted probability from the probit as an instrument in the second stage of the estimation. This method gives us consistent coefficients as well as the correct standard errors (see Wooldridge, 2001).

[27] In most of our results, we have excluded firms with zero debt because of the possible endogeneity of having a bond rating. The IV estimation, however, allows us to include these observations. Using the coefficient estimates from column VI of Table VII, we predicted the probability of having a rating for all firms, not just those with positive debt. We then included the firms with zero debt in the second stage IV estimation and the results are reported in Table VIII, column VII.

private firms, it isn't surprising to find that these firms are credit constrained. Very little public information is available about such firms, and given their small size, the relative cost of collecting this information can be quite high. When instead we examine publicly traded firms, the landscape is different. Not only are these firms much larger, but the regulatory requirements of issuing public equity means there is much more public information available about such firms. However, even in this situation, we find evidence that these firm's capital structure decisions (ability to issue debt) are constrained by the capital markets.

That firms which need to borrow from financial intermediaries (i.e. are informationally opaque) have lower leverage is not surprising. The costs of monitoring and imperfect financial contracting will raise the costs of debt capital for these firms and thus lower their desired leverage. If the monitoring and contracting solutions are not sufficient, these firms may face quantity constraints, not just more expensive capital. What is surprising is this variability is not captured by traditional measures used in the capital structure literature. Even after controlling for the firm characteristics, the magnitude of the difference in leverage is quite large and may go a long way to explaining the perceived under leverage, upon which other authors have commented.

Our findings also raise the possibility that shocks to parts of the capital markets may impact firms differentially. Slovin, Sushka, and Poloncheck (1993) both document that firms whose banks suffer shocks to their capital, which are independent of the firm's demand for capital, affect the firm's financing. If, as we speculate and as our instrumental variable results imply, firms can not easily move from one debt market to others (i.e. from the private debt markets to the public debt markets), then shocks to the banking market may have a more dramatic impact than shocks to the public bond market. In addition, since the firms that may not have access to the public debt markets

are the least transparent, the impact on their finances will probably be greater. This is an area for future exploration.

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Table I: Leverage by Bond Market Access
Panel A: All firm-years

	Mean	25 %	Median	75%
Debt/Asset (MV)				
Total Sample	18.8%	2.9%	14.5%	29.9%
Bond Market Access	26.6%	14.1%	24.4%	36.1%
No Access	17.0%	1.6%	11.4%	27.5%
Difference	9.6[1]		13.0[1]	
Debt/Asset (BV)				
Total Sample	26.1%	6.2%	23.1%	39.4%
Bond Market Access	37.2%	23.9%	34.5%	46.7%
No Access	23.5%	3.4%	18.8%	36.8%
Difference	13.7[1]		15.7[1]	

Panel B: Firm-years with positive debt

	Mean	25 %	Median	75%
Debt/Asset (MV)				
Total Sample	21.0%	6.1%	17.3%	31.9%
Bond Market Access	26.7%	14.2%	24.5%	36.1%
No Access	19.5%	4.4%	14.8%	30.1%
Difference	7.3[1]		9.7[1]	
Debt/Asset (BV)				
Total Sample	29.1%	11.5%	26.5%	41.4%
Bond Market Access	37.4%	24.0%	34.6%	46.8%
No Access	26.9%	8.7%	23.2%	39.5%
Difference	10.5[1]		11.4[1]	

Notes:

The table reports summary statistics on firm's total debt ratios by whether they have access to the public debt markets. We use whether the firm has a debt rating to measure whether it has access to the public debt markets. The market value (MV) ratio is debt divided by the book value of assets minus the book value of equity plus the market value of equity. The book value (BV) debt ratio is debt divided by the book value of assets. The book value ratio is not always between zero and one; it is above one for 1.7 percent of the sample. We re-coded the book value ratio to one for these observations. The table reports the mean, and the 25^{th}, 50^{th} (median), and 75^{th} percentile in each cell, except for the difference row. This row contains the difference in the means (or medians) and the associated significance levels (i.e. superscript 1 means the difference is statistically significant at the one percent level). In Panel A there are 79,087 firm-year observations of which 19.2% have a debt rating. Panel B contains only firm years where the firm had a positive amount of debt. In Panel B, there are 70,893 firm-year observations of which 21.4% have a debt rating. The sample is based on firms from Compustat which report sales and assets above $1M between 1986 and 2000.

Table II: Summary Statistics of Firm Characteristics

	Bond Market Access	No Access	Difference
Log(Market Value of Assets)	7.83	4.62	3.21[1]
	7.77	4.52	3.25[1]
Log(Book Value of Assets)	7.41	4.11	3.30[1]
	7.35	4.06	3.29[1]
Log of Sales	7.21	4.11	3.10[1]
	7.23	4.10	3.13[1]
Log (1 + Firm Age)	2.61	1.83	0.78[1]
	2.89	1.95	0.94[1]
Profit Margin (%)	16.26	2.43	13.83[1]
	14.54	8.08	6.46[1]
Plant, Property, & Equipment/	42.41	30.84	11.57[1]
Assets (BV) (%)	38.64	24.35	14.28[1]
Market Value of Assets/	1.68	1.97	-0.29[1]
Book Value of Assets (%)	1.40	1.45	-0.05[1]
R&D / Sales (%)	1.77	6.11	-4.34[1]
	0.00	0.00	0.00
Advertising / Sales (%)	1.11	1.31	-0.21[1]
	0.00	0.00	0.00
Marginal Tax Rate (%)	32.61	26.47	6.14[1]
(before interest expense)	34.99	34.00	0.99[1]
Equity Return previous year (%)	13.33	10.98	2.35[1]
	9.01	-1.33	10.34[1]
Implied Asset Volatility (%)	17.76	39.00	-21.24[1]
	15.03	32.48	-17.45[1]

Notes:

The table contains summary statistics for the sample of firms with a debt rating and without. The first number in each cell is the mean, the second is the median. The third column contains the difference in the means and medians as well as the statistical significance of the difference. Firms which have a debt rating are classified as having Bond Market Access.

Table III: Maturity of Debt by Bond Market Access

	1	2	3	4	5	>5
Total Sample	32.7	11.5	8.8	6.5	5.6	34.8
	20.5	4.6	3.2	1.6	0.4	24.6
Bond Market Access	16.5	5.7	6.1	6.4	6.9	58.5
	8.8	2.4	2.5	2.4	2.2	61.6
No Access	37.1	13.2	9.5	6.6	5.3	28.4
	26.2	5.8	3.6	1.3	0.1	11.4
Difference	-20.7[1]	-7.5[1]	-3.4[1]	-0.2[5]	1.7[1]	30.1[1]
	-17.4[1]	-3.3[1]	-1.2[1]	-1.0[1]	2.1[1]	50.2[1]

Note:

The table reports the fraction of outstanding debt by maturity. Firms which have a debt rating are classified as having Bond Market Access. The first five column contain the fraction of debt due in years one through five. The final column contains the fraction of debt with remaining maturity of greater than five years. The debt due in one year includes both debt with an initial maturity of less than one year as well as the current portion of long-term debt. Each cell contains the mean fraction and then the median fraction. The last row contains the difference in the means (or medians) between firms with and without bond market access (a debt rating). The associated significance levels are also reported.

Table IV: Determinants of Market Leverage
Firm Characteristics

	I	II	III	IV
Firm has a debt rating (1 = yes)	0.073[1] (0.004)	0.071[1] (0.004)	0.068[1] (0.004)	0.063[1] (0.004)
Ln(Market assets)	-0.009[1] (0.001)	-0.007[1] (0.001)	-0.023[1] (0.001)	-0.024[1] (0.001)
Ln(1 + Firm Age)	-0.005[1] (0.001)	-0.012[1] (0.002)	-0.013[1] (0.001)	-0.012[1] (0.001)
Profits / Sales	-0.068[1] (0.006)	-0.059[1] (0.008)	-0.071[1] (0.005)	-0.072[1] (0.005)
Tangible assets	0.160[1] (0.007)	0.141[1] (0.008)	0.149[1] (0.007)	0.139[1] (0.007)
Market to book (Assets)	-0.037[1] (0.001)	-0.042[1] (0.001)	-0.017[1] (0.001)	-0.017[1] (0.001)
R&D / Sales	-0.168[1] (0.008)	-0.186[1] (0.010)	-0.064[1] (0.007)	-0.067[1] (0.007)
Advertising / Sales	-0.111[1] (0.021)	-0.079[5] (0.039)	-0.040[5] (0.019)	-0.041[5] (0.019)
Marginal tax rate		-0.127[1] (0.013)		
Stock return previous year			-0.003[1] (0.001)	-0.004[1] (0.001)
σ (Asset return)			-0.320[1] (0.006)	-0.314[1] (0.006)
% of debt due in ≤ 1 year				-0.016[1] (0.004)
% of debt due in > 5 years				0.025[1] (0.003)
# of Observations	64308	48817	60478	60478
R^2	0.258	0.255	0.391	0.395

Notes:

The dependent variable is the ratio of debt to the market value of the firm's assets. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parenthesis. The market value of assets is the book value of assets minus the book value of equity plus the market value of debt. All models also include year dummy variables and a dummy variable for the regulated utility industry (4900-4939). The sample is based on firms from Compustat which report sales and assets above $1M between 1986 and 2000 and only includes firms with debt. Superscripts denote the statistical significance of each coefficient.

Table V: Determinants of Market Leverage
Panel Data Estimation

	I	II	III	IV	V
Firm has a debt rating (1 = yes)	0.059[1] (0.002)	0.110[1] (0.028)	0.046[1] (0.002)	0.079[1] (0.005)	0.037[1] (0.003)
Ln(Market assets)	-0.023[1] (0.000)	-0.033[1] (0.006)	-0.004[1] (0.001)	-0.020[1] (0.001)	0.008[1] (0.002)
Ln(1 + Firm Age)	-0.007[1] (0.001)	-0.064[1] (0.008)	0.032[1] (0.001)	-0.019[1] (0.001)	0.034[1] (0.002)
Profits / Sales	-0.071[1] (0.003)	-0.014 (0.045)	-0.061[1] (0.003)	-0.066[1] (0.006)	-0.043[1] (0.004)
Tangible assets	0.150[1] (0.004)	0.121[1] (0.022)	0.173[1] (0.005)	0.159[1] (0.006)	0.133[1] (0.009)
Market to book (Assets)	-0.016[1] (0.000)	-0.016[10] (0.008)	-0.016[1] (0.001)	-0.014[1] (0.001)	-0.013[1] (0.001)
R&D / Sales	-0.045[1] (0.005)	0.208[1] (0.072)	-0.045[1] (0.007)	-0.046[1] (0.009)	-0.024[1] (0.008)
Advertising / Sales	-0.038[1] (0.012)	-0.091 (0.178)	-0.039[5] (0.017)	-0.034[10] (0.019)	-0.027 (0.026)
Stock return previous year	-0.006[1] (0.001)	-0.057 (0.038)	-0.014[1] (0.001)	0.000 (0.003)	-0.017[1] (0.001)
σ (Asset return)	-0.301[1] (0.003)	-0.615[1] (0.052)	-0.227[1] (0.003)	-0.322[1] (0.007)	-0.166[1] (0.004)
# of Observations	60472	60472	60472	60472	50554
R^2	0.470	0.606	0.801	0.463	0.257
Controls	Industry	Industry	Firm	Firm	Firm
Estimation Method	Within	Between	Within	Between	Changes

Notes:

The dependent variable is the ratio of debt to the market value of the firm's assets. The market value of assets is the book value of assets minus the book value of equity plus the market value of debt. All models also include year dummy variables and a dummy variable for the regulated utility industry (4900-4939). The sample is based on firms from Compustat which report sales and assets above $1M between 1986 and 2000 and only includes firms with debt. Superscripts denote the statistical significance of each coefficient.

Column I - Within industry estimates. The coefficients are estimated based on variation of the variable from the industry specific means. There are 397 distinct 4 digit SIC industry dummies. The reported R^2 includes the explanatory power of the industry dummies. The R^2 is 0.310 if we exclude the explanatory power of the industry dummies.

Column II - Between industry estimates. The coefficients are estimated based on difference between industry specific means.

Column III – Within firm estimates. The coefficients are estimated based on variation of the variable from the firm specific means. There are 10,071 distinct firms. The reported R^2 includes the explanatory power of the firm dummies. The R^2 is 0.311 if we do not include the explanatory power of the firm dummies.

Column IV – Between firm estimates. The coefficients are estimated based on difference between firm specific means.

Column V – Estimates are based on first difference in all variables.

Table VI: Determinants of Interest Coverage
Firm Characteristics

	I	II	III	IV	V
Firm has a debt rating (1 = yes)	-0.651[1] (0.015)	-0.564[1] (0.016)	-0.646[1] (0.015)	-0.587[1] (0.015)	-0.658[1] (0.016)
Ln(Market assets)	0.101[1] (0.003)	0.016[1] (0.004)	0.143[1] (0.004)	0.149[1] (0.004)	0.153[1] (0.004)
Ln(1 + Firm Age)	0.129[1] (0.005)	0.114[1] (0.006)	0.150[1] (0.005)	0.147[1] (0.005)	0.151[1] (0.005)
Profits / Sales	5.632[1] (0.040)	4.386[1] (0.045)	5.544[1] (0.041)	5.580[1] (0.041)	6.134[1] (0.042)
Tangible assets	-1.291[1] (0.025)	-0.857[1] (0.026)	-1.291[1] (0.025)	-1.237[1] (0.025)	-1.373[1] (0.026)
Market to book (Assets)	0.132[1] (0.005)	0.209[1] (0.005)	0.058[1] (0.005)	0.055[1] (0.005)	0.037[1] (0.006)
R&D / Sales	-0.639[1] (0.083)	-0.017 (0.087)	-1.315[1] (0.089)	-1.310[1] (0.089)	-1.683[1] (0.093)
Advertising / Sales	-0.718[1] (0.176)	-0.518[1] (0.187)	-0.748[1] (0.178)	-0.695[1] (0.177)	-0.899[1] (0.186)
Marginal tax rate		5.036[1] (0.060)			
Stock return previous year			0.111[1] (0.009)	0.116[1] (0.009)	0.142[1] (0.010)
σ (Asset return)			1.001[1] (0.031)	0.953[1] (0.031)	0.906[1] (0.032)
% of debt due in ≤ 1 year				0.011 (0.021)	
% of debt due in > 5 years				-0.323[1] (0.019)	
# of Observations	61696	47835	58011	58011	58011
Pseudo R^2	0.178	0.212	0.186	0.188	0.195

Notes:

The dependent variable is the natural log of one plus the interest coverage ratio. Interest coverage is operating earnings before depreciation divided by interest expense. The dependent variable is recoded equal to zero, for observations with non-positive earnings and the model is estimated as a tobit with a lower limit of zero (which corresponds to interest coverage of zero), except in column V. In column V, we used a lower limit of -0.69 which corresponds to interest coverage of -0.5 [-0.69=ln(1-0.5)]. Standard errors are reported in parenthesis. All models also include year dummy variables and a dummy variable for the regulated utility industry (4900-4939). The sample is based on firms from Compustat which report sales and assets above $1M between 1986 and 2000 and only includes firm years with debt. Superscripts denote the statistical significance of each coefficient.

Table VII: Determinants of Bond Market Access
(First Stage of Instrumental Variable Regression)

	I	II	III	IV	V	VI
Firm is in the S&P 500		0.530[1]	0.535[1]	0.531[1]	0.543[1]	0.581[1]
		(0.080)	(0.081)	(0.080)	(0.081)	(0.079)
Firm trades on the NYSE		0.124[1]	0.126[1]	0.125[1]	0.129[1]	0.111[5]
		(0.043)	(0.043)	(0.043)	(0.043)	(0.043)
Log(1+Pr[Rating])			0.307[5]		0.317[5]	0.340[5]
(% of other firms in industry)			(0.153)		(0.153)	(0.153)
Log(1+Pr[Rating])				0.198[5]		
(% of other assets in industry)				(0.099)		
Firm is young					-0.091[10]	-0.088[10]
(age ≤ 3)					(0.047)	(0.047)
Firm is small						-0.436[1]
17.3% MV Asset < Leh min						(0.049)
Ln(Market assets)	0.546[1]	0.491[1]	0.486[1]	0.489[1]	0.487[1]	0.404[1]
	(0.018)	(0.019)	(0.019)	(0.019)	(0.019)	(0.022)
Ln(1 + Firm Age)	0.140[1]	0.085[1]	0.086[1]	0.085[1]	0.055[5]	0.060[5]
	(0.017)	(0.018)	(0.018)	(0.018)	(0.027)	(0.027)
Profits / Sales	-0.255[1]	-0.255[1]	-0.233[1]	-0.256[1]	-0.238[1]	-0.232[1]
	(0.088)	(0.086)	(0.086)	(0.086)	(0.087)	(0.087)
Tangible assets	0.269[1]	0.262[1]	0.222[1]	0.243[1]	0.219[1]	0.215[5]
	(0.084)	(0.083)	(0.083)	(0.083)	(0.083)	(0.084)
Market to book (Assets)	-0.121[1]	-0.124[1]	-0.121[1]	-0.122[1]	-0.121[1]	-0.128[1]
	(0.019)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Advertising / Sales	0.636[10]	0.488	0.506	0.455	0.517	0.498
	(0.373)	(0.375)	(0.372)	(0.378)	(0.373)	(0.377)
σ (Asset return)	-1.936[1]	-2.009[1]	-1.961[1]	-2.000[1]	-1.968[1]	-1.965[1]
	(0.123)	(0.124)	(0.126)	(0.125)	(0.126)	(0.127)
# of Observations	60475	60475	60475	60475	60475	60475
Pseudo R^2	0.465	0.472	0.472	0.472	0.472	0.477
F-statistic ($\beta_{Instruments} = 0$)		50.3[1]	55.5[1]	56.7[1]	59.1[1]	129.1[1]

Notes:

The table contains estimates from a probit model where the dependent variable is whether the firm has a bond rating (i.e. access to the public debt markets) or not. Positive coefficients imply increases in the variable are associated with a higher probability of a bond rating. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parenthesis. The Pseudo-R is the log-likelihood of the maximum likelihood minus the log-likelihood when only the constant is included. The list of instruments used are: 1) whether the firm is in the S&P 500 (0 or 1), 2) whether the firm's equity trades on the NYSE (0 or 1), 3), log of one plus the probability that firms in the same 3 digit SIC industry have a bond rating, 4) log of one plus the probability that firms in the same 3 digit SIC industry have a bond rating weighted by firm size, 5) whether the firm's age is three or less (0 or 1), and 6) whether the firm's size times the median debt ratio (0.173) is less than the minimum bond size required to be included in the Lehman Brothers Corporate bond index. All models also include year dummy variables and a dummy variable for the regulated utility industry (4900-4939) as well as the firms R&D to sales ratio and its stock return over the previous year. The last row contains the F-statistic and its significance level for the test that the coefficients on the instruments are jointly zero. The sample is based on firms from Compustat which report sales and assets above $1M between 1986 and 2000 and only includes firms with debt. Superscripts denote the statistical significance of each coefficient.

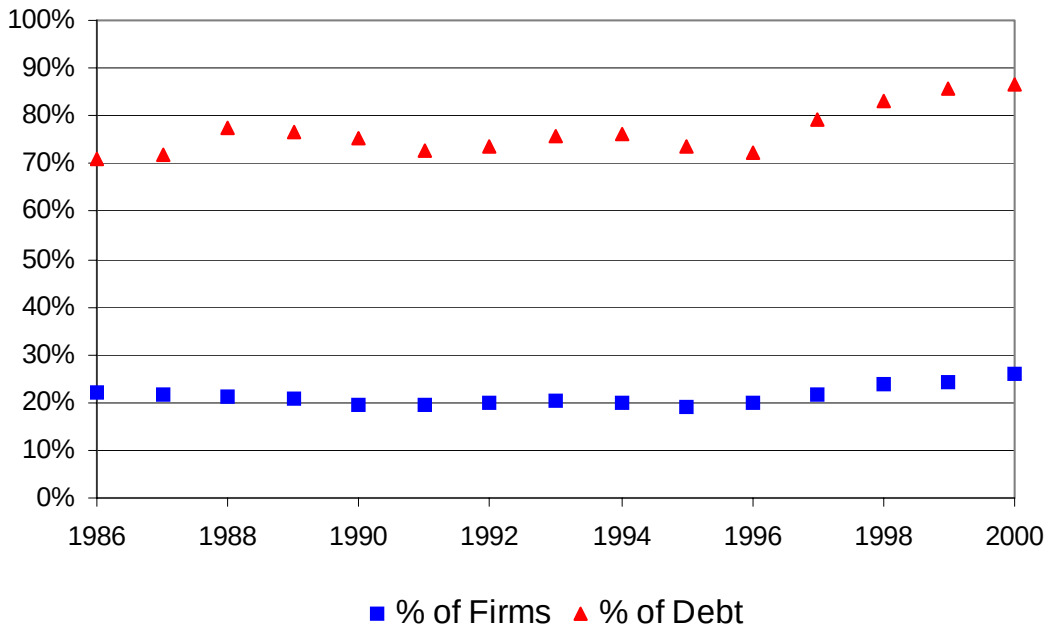
Table VIII: Determinants of Market Leverage
(Second Stage of Instrumental Variable Regression)

	I	II	III	IV	V	VI	VII
Firm has a debt rating (1 = yes)	0.068[1]	0.063[1]	0.066[1]	0.065[1]	0.067[1]	0.061[1]	0.066[1]
	(0.004)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Ln(Market assets)	-0.023[1]	-0.023[1]	-0.023[1]	-0.023[1]	-0.023[1]	-0.023[1]	-0.020[1]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln(1 + Firm Age)	-0.013[1]	-0.013[1]	-0.013[1]	-0.013[1]	-0.013[1]	-0.013[1]	-0.013[1]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Profits / Sales	-0.071[1]	-0.071[1]	-0.071[1]	-0.071[1]	-0.071[1]	-0.072[1]	-0.076[1]
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Tangible assets	0.149[1]	0.149[1]	0.149[1]	0.149[1]	0.149[1]	0.149[1]	0.159[1]
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Market to book (Assets)	-0.017[1]	-0.017[1]	-0.017[1]	-0.017[1]	-0.017[1]	-0.018[1]	-0.014[1]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
R&D / Sales	-0.064[1]	-0.064[1]	-0.064[1]	-0.064[1]	-0.064[1]	-0.064[1]	-0.072[1]
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
Advertising / Sales	-0.040[5]	-0.040[5]	-0.040[5]	-0.040[5]	-0.040[5]	-0.040[5]	-0.060[1]
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.017)
Stock return previous year	-0.003[1]	-0.003[1]	-0.003[1]	-0.003[1]	-0.003[1]	-0.003[1]	-0.002[5]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
σ (Asset return)	-0.320[1]	-0.320[1]	-0.320[1]	-0.320[1]	-0.320[1]	-0.320[1]	-0.309[1]
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)
# of Observations	60478	60475	60475	60475	60475	60475	67539
R^2	0.391	0.390	0.390	0.390	0.390	0.390	0.396
Estimation Method	OLS	IV	IV	IV	IV	IV	IV

Notes:

The table contains instrumental variable estimates, except for column I which contains OLS estimates. The instruments used in each column (II-VI) are the ones used in the same column of Table VII (II-VI). In column VII, we use the coefficients from column VI of Table VII to predict the probability of having a rating, but this time include the firms with zero debt. This allows us to include the zero debt firms in the second stage of the IV as well. The list of instruments used are: 1) whether the firm is in the S&P 500 (0 or 1), 2) whether the firm's equity trades on the NYSE (0 or 1), 3), log of one plus the probability that firms in the same 3 digit SIC industry have a bond rating, 4) log of one plus the probability that firms in the same 3 digit SIC industry have a bond rating weighted by firm size, 5) whether the firm's age is three or less (0 or 1), and 6) whether the firm's size times the median debt ratio (0.173) is less than the minimum bond size required to be included in the Lehman Brothers Corporate bond index. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parenthesis. The sample is based on firms from Compustat which report sales and assets above $1M between 1986 and 2000 and only includes firms with debt. Superscripts denote the statistical significance of each coefficient.

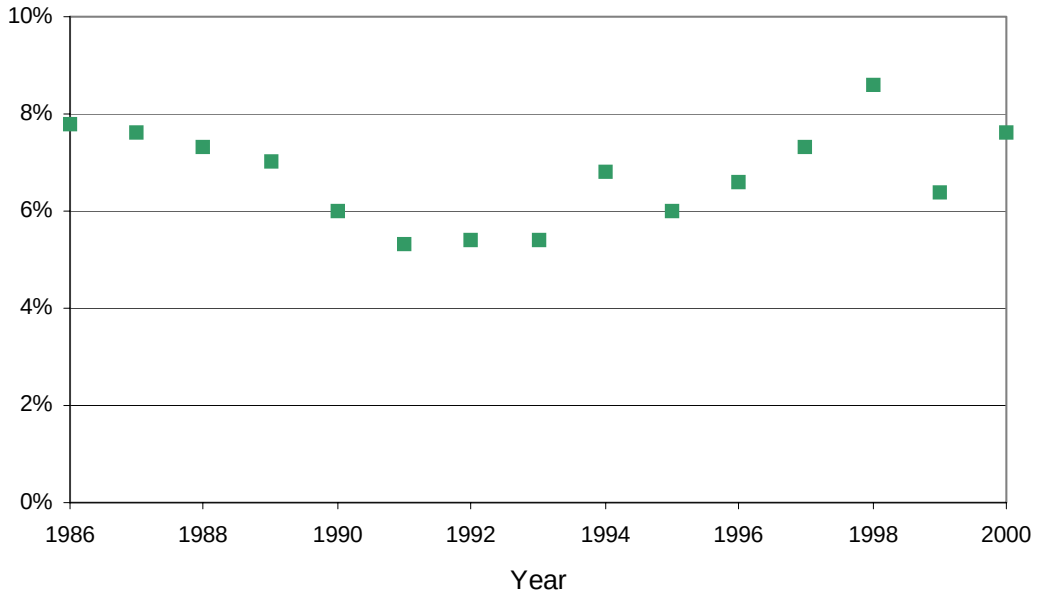
Figure 1: Percent of Firms or Debt with a Debt Rating



Notes:

The figure contains the percent of firms with a debt rating (squares) or the percent of outstanding debt (in dollars) issued by firms with a debt rating (triangles). A firm has a debt rating if it reports either a bond rating or a commercial paper rating. The sample is based on firms from Compustat which report sales and assets above $1M between 1986 and 2000.

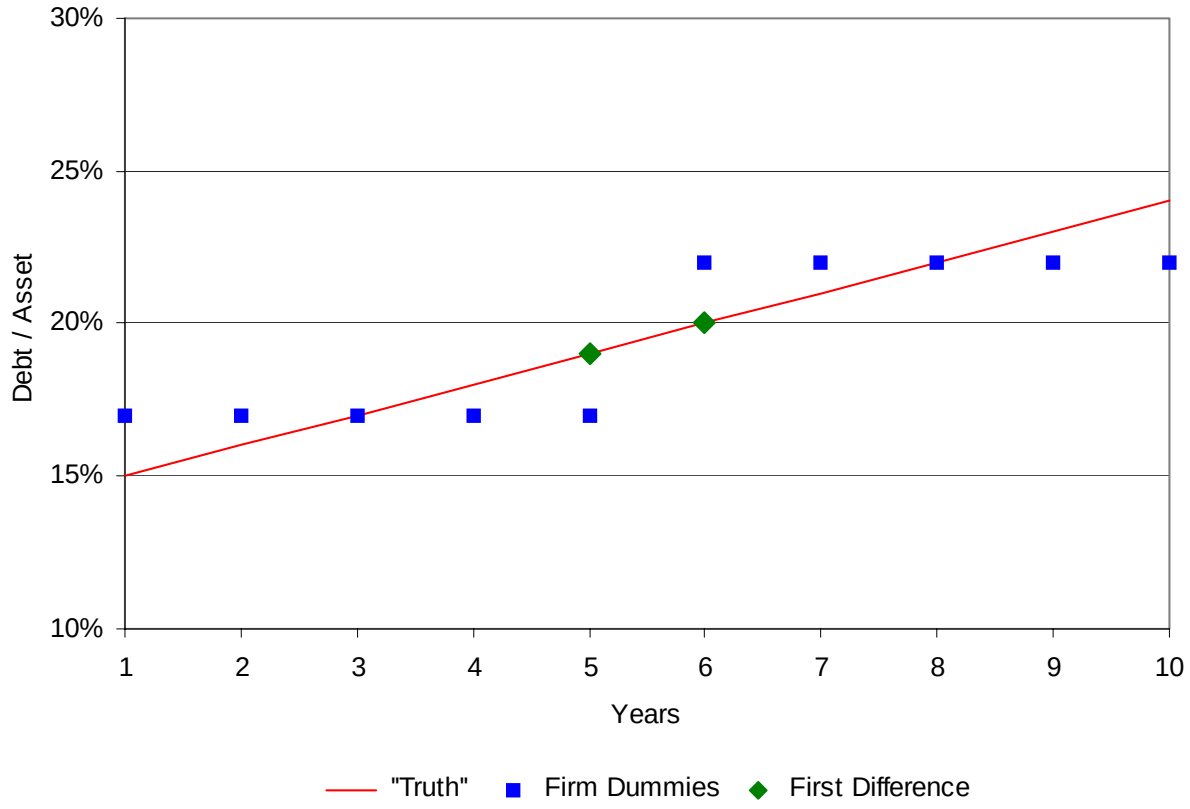
Figure 2: Effect of Rating on Leverage
Time Variation



Notes:

The figure contains the estimated coefficients from a regression of leverage on the firm having a rating, where a separate coefficient is estimated for each year. The regression includes the same controls as those reported in Table IV, column III.

Figure 3: Illustration of Panel Data Estimates



Note:

This figure is an illustration of the relative magnitudes of the within and difference estimates of the rating coefficient in a panel data set. In this example, the firm's true or desired leverage rises one percent per year over the sample period (the straight line). In the sixth year of the sample, the firm obtains a bond rating and maintains it for the rest of the sample period. The within estimate (like column III of Table IV) is the difference between the average leverage in years when the firm had a rating (years 6-10) and years in which it did not (years 1-5). These averages are reported as squares and the difference in the averages is 5 percent. The difference coefficient is the difference between the debt ratio the first year the firm has a debt rating and the debt ratio the prior year (diamonds). The difference coefficient is 1% in this illustration. Since the change in the desired debt ratio (the line) is slow, the difference coefficient is only 20% of the within coefficient (0.20 = 1%/5%).