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Does the Source of Capital Affect Capital Structure?

Michael Faulkender
Olin School of Business, Washington University in St. Louis

and

Mitchell A. Petersen
Kellogg School of Management, Northwestern University
and NBER

Abstract

Implicit in much of the empirical work on leverage is the assumption that the availability of incremental capital depends solely on the 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 intuition, arguing that the same characteristics that may be associated with firms being rationed by the debt markets are also associated with financial intermediaries, as opposed to bond markets, being the source of a firm's debt. We find that firms have significantly different leverage ratios based on whether they have access to public bond markets, as measured by 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 instrumenting for the possible endogeneity of having a bond rating, we find that firms which are able to raise debt from public markets have 35 percent more debt.

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I) Introduction

Absent the assumptions 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 more favorable 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 assumes that firms have the opportunity to increase their leverage and are choosing to leave money on the table. An alternative explanation is that firms may be unable to issue additional debt. The same type of market frictions which make capital structure choices relevant (information asymmetry and investment distortions) also imply

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

that firms are sometimes 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).

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 a firm's 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 credit 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, but are a potentially more expensive source of capital, and the public debt markets. The higher cost of private debt capital may arise from the expenditure on monitoring or because of the tax disadvantage of the lender's organizational form (Graham, 1999). 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 manifest itself in the form of 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 more than fifty percent higher than firms which do not have access (28.4 versus 17.9 percent).

Debt ratios should depend upon firm characteristics as well. Thus, a difference in leverage does not necessarily 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 argue 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, cannot easily be evaluated by outside lenders, firms may be unable to raise sufficient capital to fund all of their good projects (Stiglitz and Weiss (1981)).[2] Such market frictions create the possibility for differentiated financial markets or institutions to arise (Leland and Pyle, 1977, Diamond, 1984, Ramakrishnan and Thakor, 1984, Fama, 1985, Haubrich, 1989, and Diamond 1991). These financial intermediaries are lenders that specialize in collecting information about

[2] The model in Stiglitz and Weiss (1981) is a model of credit (or debt) constraints. The lenders are unwilling to lend sufficient capital to the firm for it to undertake all of its positive NPV projects. Thus, the firms are constrained by the debt markets. Since in the model, debt is the only source of capital, these firms are also capital constrained. If these firms were able to issue equity, they would no longer be capital constrained (they would have sufficient capital to take all positive NPV projects), however they would still be credit constrained, i.e. they would have less debt. We empirically examine this distinction below.

borrowers which they then use in the credit approval decision (Carey, Post, and Sharpe, 1998). 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. These financial relationships have been empirically documented to be important in relaxing capital 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). In addition, financial intermediaries may also be more efficient at restructuring firms which are in financial distress (Rajan, 1992, Bolton and Scharfstein 1996).

This intuition is the basis for the empirical literature which has examined firms' choices of lenders. 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, 2004, 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 be passed back to the borrower and it 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 among two firms with identical projects the one which needs to be monitored (for example, an entrepreneur without a track record) will find that the cost of their debt capital is greater. This cost of monitoring will be passed on to the borrower in the form of higher interest rates, causing the firm to reduce it use of debt capital. In addition, if the monitoring and additional information collection performed by the financial intermediary cannot completely eliminate the information asymmetry, credit may still be rationed. Thus, if we compare firms which are able to borrow from the bond market to those which cannot, we will find that firms with access to the bond market have more leverage. This effect can occur directly through a quantity channel (lenders are willing to lend more) or indirectly through a price channel (firms have access to a cheaper source of capital). Either way, opening a new supply of capital to a firm will increase the firm's leverage.

B) Empirical Strategy.

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. If firms which do not have access to the public debt markets are constrained in the amount of debt they may issue, they should be less levered even after controlling for other determinants of capital structure. The observed level of debt is a function of the supply of debt and the firm's demand for debt, which depend upon the price of debt capital and supply and demand factors.

$$\begin{aligned} Q_{Demand} &= \alpha_0\ Price + \alpha_1\ X_{Demand\ \ factors} + \varepsilon_D \\ Q_{Supply} &= \beta_0\ Price + \beta_1\ X_{Supply\ \ factors} + \varepsilon_S \end{aligned} \qquad \textbf{(1)}$$

If there are no supply frictions, then firms can borrow as much debt as they want (at the correct price), and the observed level of debt will equal the demanded level. This is the traditional assumption in the empirical capital structure literature. Only demand factors explain variation in the firm's debt level, where demand factors are any firm characteristic which raises the net benefit of debt. Examples include higher marginal tax rates and lower costs of financial distress.

However, if firms which do not have access to the public debt markets are constrained in the amount of debt which they may issue (e.g. private lenders do not fully replace the lack of public debt), they will have lower leverage ratios, even after controlling for the firm's demand for debt. Equating the demand and supply equations, we can express the above equations as two reduced form equations, one for quantity and one for price, so that each is only a function of the demand and supply factors.

$$\begin{aligned} Q_{Observed} &= \gamma_D X_{Demand\ \ factors} + \gamma_S X_{Supply\ \ factors} + \mu \\ &= \gamma_D X_{Demand\ \ factors} + \gamma_S \text{ Bond market access} + \mu \end{aligned} \qquad \textbf{(2)}$$

This is the regression which we will run throughout the paper. We examine whether firms which have access to the public debt markets have access to a greater supply of debt, and are thus more highly levered. We use whether the firm has a bond rating or a commercial paper rating as a measure of whether the firm has access to the public bond markets. Previous research on the source of debt capital has focused on small hand collected data samples to accurately document the source of each of the firm's debt issuances (Houston and James, 1996, Cantillo and Wright, 2000). 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 firms have a debt

rating but no public debt.[3]

Although having a bond rating is an indication of having access to the bond market, it is not exactly the same. Firms may not have a debt rating either because they don't have access to the bond market or because they do not want a debt rating or public debt (see Figure 1). Thus a positive coefficient on having a rating in equation (2) could be either the supply effect we are testing for or unobserved demand factors which are correlated with having a rating. To argue that the bond rating variable is in fact a supply variable, we use two separate approaches. First we control for firm characteristics which measure the amount of debt a firm would like to have. If we could completely control for variation in the demand for debt with our other independent variables, then the rating variable would only measure variation in supply. After controlling for observed and unobserved variation in firm characteristics (demand factors), we find that leverage is significantly higher for firms with a rating. These results are reported in Section III.

Our second approach is to directly examine the variation in supply. We do this by estimating an instrumental variables version of the model. By instrumenting for a firm having a rating, we can examine the variation in our variable which is only due to our instruments. This allows us to distinguish between firms that can't get a rating and those that don't want a rating. These results are reported in Section IV.

C) Data Source.

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

[3] "When a corporation is rated, it almost always has a positive amount of publicly traded debt: in the older data set (where the authors 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).

(6000s SICs) and the public sector (9000s SICs). We also exclude observations where the firm's sales or assets are less than $1M. Since the firms we examine are publicly traded, they should in theory be less sensitive to credit rationing than the private firms which are the focus of some of the literature (Petersen and Rajan, 1994, and Berger and Udell, 1995).

Throughout most of the paper, we measure leverage as the firm's debt to asset ratio. Debt 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 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, which we define 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 (see Section III-D).

D) Rarity of Public Debt

Even for public companies (firms with publicly traded equity), public debt is uncommon (Himmelberg and Morgan, 1995). 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. Across the sample period, this average ranges from a low of 17 percent (in 1995) to a high of 22 percent (in 2000, see Figure 2). Conditioning on having debt raises the fraction of firms with a debt rating to only 21%. Even among firms with debt, public debt is a rare source of capital for public firms.

The importance of public debt is greater if we look at the fraction of dollars of debt which are public, as 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.[4] 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 firms with a debt rating (see Figure 2). 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.

E) Debt Market Access and Leverage.

Traditional discussions of optimal capital structure 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 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 greater 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 10.5 percentage points. These firm's average debt ratio is 28.4 percent, versus 17.9 percent for the sample of firms without a rating (p-value<0.01).When we examine debt ratios based on book values, the difference is slightly larger: 37.2 versus 23.5 percent (p-value<0.01).[5] These are large differences in debt. A debt rating

[4] To calculate the 2.9 trillion number, we added up the total debt of all firms with a debt rating. Some of the firms with a debt rating must 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. These results imply that firms with access to the bond market can and do borrow from private debt markets as well.

[5] The book debt ratios for some of the firms are extremely high. To prevent the means from being distorted by a few observations, we re-coded the book debt ratio to be equal to one if it was above one. We re-coded 1.3 percent of the book value ratios this way. The recoding moves the mean of the entire distribution from 26.9 to 26.1%, which

increases the firm's debt by 59 percent [28.4 - 17.9)/17.9].

The difference in leverage is very robust. We see the same pattern across the entire 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 13.7 percentage points (from 12.0 to 25.7) and the book value ratio by 15.7 percentage points. Both changes are statistically significant (p-value<=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 5.7 to 13.7 percent across years (or 7.2 to 18.7 percent for book value ratios). The difference is always statistically significant.

A fraction of the firms in our sample have zero debt. These firms may be completely rationed by the debt markets. Alternatively, they may have access to the (public) debt markets but choose to finance themselves with only equity. If they do not want debt capital, and thus don't have a bond rating, they will be incorrectly classified as not having access to the bond market. To be conservative, we initially exclude the zero debt firms from our sample. In the instrumental variables section of the paper, we can include these firms and test whether they have access to the bond market (see section IV-A). When we recalculated the average debt ratios including only firms which have debt, our results do not change dramatically as only a small fraction of firms have zero debt (10 percent of the firm years in our sample). Firms with access to the public debt markets have significantly more debt – 8.0 percentage points higher market debt ratio or 39 percent more debt

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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. Firms with public debt have higher leverage (47 versus 34%, Table V), but the paper doesn't note this finding .

(8.0/20.5, see Table I-B).

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. 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.[6] 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. This difference could be driven by either demand or supply considerations. It may be that the type of firms which 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

[6] For example, since our data comes from Compustat, only firms 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. Discussions with the ratings agencies and other data samples, suggest the magnitude of this mis-classification should be small. For example, in Ljungqvist, Marston and Wilhelm's (2003) sample, 97.8% of the public bond issues were rates by S&P and 97.6% were rated by Moody's. We thank Alexander Ljugqvist for providing us with these numbers.

of the empirical capital structure literature. Although Modigliani-Miller irrelevance is assumed not to hold on the demand side of the market, it is assumed to hold on the supply side.[7] Our univariate results cannot 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 firms with access to the bond market are more leveraged, we must first determine how the two samples are different and whether this difference explains the difference in leverage we found in Table I. Based on the firm characteristics examined in the empirical literature, 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), 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).

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

As previous work has noted, the maturity of a firm's debt is also correlated with the source 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, firms with a debt rating have debt with 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 16 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 characteristics which theory predicts would cause a firm to demand more debt. Therefore to argue that the difference in leverage from having a debt rating is a supply effect, it is essential that we control for firm characteristics which determine a firm's demand for debt.

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.[8] We examine variation in the supply of debt capital 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 (Pulvino, 1998). 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 firms' 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 raise 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 5.4 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

[8] 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 0.231 to 0.242 (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 -2.0 (1993) to a high of 4.2% (1999) relative to the base year of 1986.

variability in a firm's advertising to sales ratio is even smaller. Part of the reason 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), consistent with such firms using 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). Larger firms are less risky and more diversified, and therefore, the probability of distress and the expected costs of financial distress are lower. They may also have lower issue costs (owing to 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 \$38M (25^{th} percentile) to \$804M (75^{th} percentile) lowers the firm's leverage by almost three percentage points ($p<0.01$).[9]

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=-0.1, regression not reported). The difference between our results and previous work comes from two sources. 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).

[9] To test that we have correctly specified the functional form of size, 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 0.003 and the estimated leverage based on this model is almost identical to the estimated leverage based on this initial model (see Figure 3).

If we use long-term debt to assets and re-run the regression without the debt rating variable, the coefficient on size becomes positive and is similar in magnitude to prior findings ($\beta = 0.007$, $p<0.01$, regression not reported).[10] 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 have debt ratings because of economies of scale in the bond markets (see Table II and Section IV below). The second difference is that we only include firm-years which report positive debt. If we include all observations and re-run the regression without the debt rating variable, then the coefficient on size is again positive ($\beta = 0.004$, $p<0.01$, regression not reported).The interpretation is subtle. Larger firms are more likely to have some debt. However, conditional on having some debt, larger firms are less levered. 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 (0.089 versus 0.083 in Table IV, column I).[11]

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

[10] 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 and less short-term debt.

[11] We calculate White heteroscedastic consistent errors, corrected for possible correlation across observations of a given firm, in all of the regressions (White, 1980 and Rogers, 1993). Since the residuals for a given firm are correlated across different years, the normal OLS standard errors are understated. For example, the OLS t-statistic on having a bond rating is 40.6, but the t-statistic based on the corrected standard errors is 18.2.

The coefficients and standard errors can also be estimated using the Fama-MacBeth approach (Fama and MacBeth, 1973) and these numbers are reported in column II of Table IV. The Fama-MacBeth approach corrects for cross sectional correlation in the error term (e.g. the correlation of two firm's observation in the same year). Since our regressions already include time dummies, the cross sectional correlation has already been removed. Consistent with this intuition the OLS estimates with the corrected standard errors and t-statistics are similar to those produced by the Fama-MacBeth approach (a standard error of 0.0057 versus 0.0045 on the "Firm has a debt rating" variable).

idea 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, Graham (1996) and Graham, Lemmon, and Schallheim (1998), and Graham (2000)). When we include the simulated marginal (pre-interest income) tax rates, we find 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 (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 and they are also more likely to go to banks 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.[12] 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, 2004). If the firm does not constantly adjust

[12] The correct formula for asset volatility is:

$$\sigma_A = \sqrt{\left(\frac{E}{A}\right)^2 \sigma_E^2 + \left(\frac{D}{A}\right)^2 \sigma_D^2 + 2\left(\frac{D}{A}\right)\left(\frac{E}{A}\right) \rho\, \sigma_D\, \sigma_E} \qquad \textbf{(3)}$$

Thus our estimate of asset volatility understates the true asset volatility. More importantly, 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 also estimated the asset volatility using a Merton model (see Ronn and Verma (1986)):

$$\sigma_A = \frac{\frac{E}{A}\sigma_E}{\Delta(\sigma_A)} \qquad \textbf{(4)}$$

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 (0.079 versus 0.078).

its capital structure, then following unexpected increases in its asset (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 magnitude of this effect is tiny. A 59 percentage point increase in equity values (the interquartile range) lowers the firm's leverage by only 40 basis points. This may be due to the fact that the firms in our sample often adjust their capital structure.[13]

The purpose of including the firm characteristics is to determine whether the difference in observed 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 significantly more levered ($p<0.01$) with debt levels equivalent to between 7.8% and 8.3% of the market value of the firm higher than firms without access to public debt markets.[14]

As discussed above, firms with a debt rating issue bonds which have longer maturities than

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[13] The firms in our sample change their debt or equity (changes which are not due to changes in retained earnings) by more than 5 percent of the market value of assets in the previous year in 50 percent of the firm-years. This number is similar to what Kisgen (2004) and Leary and Roberts (2004) find in their respective samples. Since firms do not actively adjust their capital structure each year, this may affect our results. To verify that this is not a problem, we reran our regressions on the sub-sample of firms which significantly adjusted their leverage and on the sub-sample which did not. We found that the coefficient on having a rating, as well as firm size and past equity return, do not change significantly across the two sub-samples.

[14] 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 7.8 (Table IV, column IV) to 8.2 when we used net debt. Thus, firms without access to the bond market not only have less debt, but they also hold slightly more cash (see Opler, Pinkowitz, Stulz, and Williamson, 1999 for evidence that firm's with a bond rating hold less cash). Next, we estimated Table IV using debt plus accounts payable as the dependent variable. Again the coefficient on having a rating rises slightly from the 7.8% we report in column IV to 8.2% when we include accounts payable as debt. Finally, we included the capitalized value of operating lease payments as defined in Graham, Lemmon, and Schallheim (1998). Capital leases are already included in our definition of debt. Including operating leases raises the coefficient on having a rating slightly to 8.2%.

debt from private markets (see Table III). We would expect firms for whom it is difficult to write contracts constraining their behavior would issue shorter term debt and be more likely to borrow from banks (von Thadden, 1995). Thus it is not surprising that leverage and maturity are correlated (Barclay and Smith, 1995a). To verify that our measure of bond market access is not proxying for contracting problems as measured by 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 are most likely a simultaneous decision. The purpose of this regression is to verify that the two effects (debt rating and maturity) are in fact distinct. We find that they are. A firm which changed its debt maturity from all due in one year to all due beyond five years would raise its predicted debt ratio by 5 percentage points (see Table IV, column V). Even after controlling for maturity, however, we find that firms with a debt rating have significantly more debt ($\beta = 0.071$, $t=16.6$).[15]

To verify that our results are not driven by a few years, we re-estimated our model (Table IV, column IV) allowing the coefficient on having a rating to vary by year (i.e. we interacted the year dummies with the debt rating variable). We have graphed the debt rating coefficients against time in Figure 4. 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%

[15] 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 bank debt is more expensive than bonds, 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). Bharath (2002) finds that bond debt is cheaper for firms which are rated A and above, but more expensive for firms with lower ratings. However, one must be careful interpreting these results in our context as the sample is conditioned on having a bond rating, and thus can't compare the cost of debt for firms which have access to the bond market and those which do not.

higher than an otherwise identical firm) to a high of 8.6% in 1998. The variability in the coefficients is also statistically significant (F-stat(14,60435) = 3.75, p-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 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, since they would be increasingly under-levered relative to firms with access to the bond market (Calomiris, Himmelberg, and Wachtel,1995, Korajczyk and Levy, 2003).

Our results demonstrate that firms which do not have access to the bond market may be credit (debt) constrained or under levered. This is consistent with these firms also being capital constrained, although not proof of it. Since several papers in the literature have used whether the firm has a bond rating as a proxy for being capital constrained (Whited, 1992; Kashyap, Stein, and Wilcox, 1993; Kashyap, Lamont, and Stein, 1994; Gilchrist and Himmelberg, 1995; Almeida, Campello, and Weisbach, 2003), it is worth examining this more closely. Firms which are constrained by the debt markets may substitute equity for debt. We find some evidence consistent with this notion. Firms without access to the bond market pay lower dividends (the ratio of dividends to the market value of assets is 0.64% smaller), repurchase less stock (their repurchase relative to the market value of their assets is 0.41% lower) and issue more equity (their equity issues relative to the market value of their assets is1.88% higher). Thus on net, the firms without a bond rating are paying out a net dividend as a percentage of firm value (dividends plus repurchases minus equity issues) which is 2.94% smaller than firms with a bond rating (p-value < 0.01). We find similar

results when we instrument for having a bond rating.

C) Industry and Firm Fixed Effects

Since many of the benefits and costs of debt depend upon the type of assets the firm uses in its operations, 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 means), 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 verify that having a debt rating is not 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 when we include controls for each of the 396 industries (four digit SIC) in our sample (from 7.8% in Table IV, column IV to 6.8% in Table V, column I). When we instead run the regression on industry means, the coefficient is larger (13.9%).

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 cannot be a proxy for any unobserved firm 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 5.1%, 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 (R^2 = 76%), and we still find that firms with access to the debt markets are significantly more levered.

Given the inclusion of firm specific dummies in the regression, constant unobserved firm characteristics cannot explain our results. The only remaining possibility is that a firm's demand for debt rises over the sample period in ways that we do not observe. If the firm also obtains a rating during the sample period, this could 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 (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), will be much larger than the estimates in column V (first difference estimates). This isn't what we find. The first difference coefficient (4.1%) is almost as large as the within estimate (5.1%), meaning that 81% of the leverage difference is accounted for in the first year the firm obtains a rating.[16] Thus the only way our finding could be driven by unobserved demand factors is if these factors are constant across time, but then change dramatically in the year the firm obtains a debt rating. Although possible, it seems unlikely that the firm's industry, asset type, or tax situation changes only in the year the bond rating is obtained. To check this possibility, we read a sample of 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

[16] A numerical example may help illustrate this point. Take a case where the firm's desired leverage ratio rises one percentage point per year over the ten year sample period in an unobserved way (the straight line in Figure 5). Assume 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 thus 5 percent in this case. The two averages are denoted by the squares in Figure 5 (i.e. 22% and 17%). The first difference coefficient is the difference between the debt ratio the first year the firm has a debt rating and the debt ratio the previous year (the diamonds in Figure 5). The difference coefficient is 1% (20%-19%). Since the change in the desired debt ratio (the line in Figure 5) 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 (4.1/5.1).

characteristics. We can more formally test whether unobserved firm demand factors are driving our results, by examining the instrumental variable results. We turn to them in Section IV.

D) Interest Coverage

Most of the literature on leverage has focused on the debt to asset ratio 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 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 low 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).[17]

The intuition we found based on debt ratios is replicated with interest coverage, although the 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 active monitors such as banks developed to cater to informationally opaque firms. There has been little empirical work, however, 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, Denis and Mihov, 2001, Himmelberg and Morgan, 1995, Krishnaswami, Spindt, and Subramaniam, 1999, Lemmon and Zender, 2003, Sunder, 2002,). Thus, understanding how firms and lenders are matched is an interesting question in and of itself.

We are also interested in the determinants of bond market access to control for the possible

[17] 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 -0.646 (Table VI, column III) to -0.658 (column V).

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 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. We know that 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 an 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 which firms have 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 some of the firm characteristics which are correlated with higher leverage ratios are also associated with having a bond rating. Older firms, firms with more tangible assets, and firms with less volatile assets are 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 25^{th} percentile (14%) to the 75^{th} percentile (49%) raises the probability of having a bond rating by only 0.9%; whereas lowering a firm's asset volatility from the 75^{th} percentile (48%) to the 25^{th} percentile (17%) raises the probability of having a bond rating by 9.0% (Hadlock and James,

2002).[18] 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 debt as well as a minimum critical size for a bond issue to be viable (liquid). We return to this issue below.

For instruments, we need variables which 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.[19] 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 the index 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 returns, but since it can raise a firm's visibility, it also makes a good potential instrument. Both variables are positively correlated with

[18] To calculate estimated probabilities, we set all variables equal to their actual value except for the variable 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.

[19] In theory, either or both institutions 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 the banks feel that they can not place the bonds, there is no reason to secure a rating. If a bank feels that it can place a firm's bonds in the market, then the firm secures a rating. The rating agencies charge an initial fee which can range from $50K to $200K, and then an additional fee each year to cover the cost of maintaining the rating.

having a debt rating and the relationship is statistically significant (Table VII, column II, p-value<0.01).[20] However, the economic impact of being included in the S&P 500 is 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]

The probability of having public debt is also related to how unique the firm is. A new firm which manufactures automobiles will be able to issue bonds more easily, since the bond market already knows the industry and the competitors, as most automobile manufacturers have outstanding public debt (Ben Dor, 2003, finds similar results in the IPO market). This lowers the costs of investigating the firm and its 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, its competitors, and the industry to potential investors. 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 of interest. The log of one plus this percentage is included as an additional instrument.[22] Consistent

[20] 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) in finite samples. To verify that this is 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 will be unbiased.

[21] Both the S&P 500 and the NYSE dummy are correlated with size, although the correlations are not huge (0.48 and 0.43 respectively). This is why including these dummy variables does not change the coefficient on size dramatically (compare the coefficient in columns I and II of Table VII). However, if these variables are picking up a non-linear relationship between leverage and size, then they would not be valid instruments. This is why we verified that the relationship between leverage and size is linear (see footnote 9 and Figure 3). These two variables are therefore valid instruments.

[22] We use the log of one plus the probability, as 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 one plus the probability with the probability, the coefficient drops from 0.300 to 0.189 and

with our hypothesis, if more firms in a given industry have a bond rating, this raises the probability of a firm in that industry having a debt rating (see Table VII, column III, p-value=0.054).[23] 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 3.3%. As a robustness check, we also calculated the percentage using the market value of each firm's assets as weights (Table VII, column IV). Thus, the percentage is the fraction of assets, excluding the firm's assets, which are from firms with a public bond rating. The coefficient on this variable is also statistically significant, but the magnitude is smaller (0.128 versus 0.300).

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 (1.2%) and is less significant statistically than the other instruments (p=0.111). Other age cut-offs produced even weaker results.

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.

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the t-statistic drops from 1.9 to 1.6.

[23] 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).

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.[24] 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 variable is defined as equal to one if the size of the firm (the market value of assets) times 0.183 (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 6.6% 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 IV) for comparison, while the remaining columns are the second stage estimates based on the first stage estimation in the corresponding column of Table VII.[25] Instrumenting for having a bond rating does lower the estimated coefficient

[24] 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=0.454, t=7.5).

[25] 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 a miss specification of the data. Instead we estimated the first stage as a probit (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).

from the original 0.078, however, the estimated coefficient is still large. Depending upon the instruments used, having a bond rating raises the leverage of the firm by between 5.7 and 6.3% ($p<0.01$).

In most of our results, we have excluded firms with zero debt because of the possible endogeneity of having a bond rating. Since the second stage of the IV estimates does not use whether the firm has a debt rating, we can include firms which do not have debt in the sample. We use the coefficients from column VI of Table VII to predict 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 instrumental variable estimation (Table VIII, column VII). In the expanded sample, having access to the bond market increases a firm's leverage by 6.5%. This coefficient is larger than the estimate in column VI (5.7%), which confirms our initial impression that excluding the zero debt firms was being conservative. Zero debt firms, like Microsoft, that could get a debt rating but do not, are not representative of the zero debt firms in our sample. Instead, most of the zero debt firms have characteristics which our first stage regression suggests make them unlikely to be able to access public debt markets (their predicted probability of having a debt rating is 4.8 percent versus 21.9 percent for the firms with positive debt). Thus, including the zero debt firms in our examination increases the estimated difference in leverage.

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 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 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 (see Titman, 2002, for a general discussion).

That firms which need to borrow from financial intermediaries (i.e. they are more 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 thereby lower their desired leverage. If monitoring and contracting solutions are not sufficient, these firms may face quantity constraints, not just more expensive capital. What is surprising is that this variability is not captured by traditional measures used in the capital structure literature. Even after controlling for the firm characteristics and unobserved heterogeneity, 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) document that firms whose banks suffer shocks to their capital which are independent of the firm's demand for capital can affect the firm's financing. If, as we speculate, and as our instrumental variable results imply, firms cannot 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	19.9%	3.0%	15.3%	31.7%
Bond Market Access	28.4%	14.8%	25.7%	38.4%
No Access	17.9%	1.6%	12.0%	29.1%
Difference	10.5[1]		13.7[1]	
Debt/Asset (BV)				
Total Sample	26.1%	6.2%	23.1%	39.4%
Bond Market Access	37.2%	23.9%	34.5%	46.8%
No Access	23.5%	3.4%	18.8%	36.8%
Difference	13.8%		15.7[1]	

Panel B: Firm-years with positive debt

	Mean	25 %	Median	75%
Debt/Asset (MV)				
Total Sample	22.2%	6.3%	18.3%	33.7%
Bond Market Access	28.5%	14.9%	25.8%	38.5%
No Access	20.5%	4.6%	15.7%	31.9%
Difference	8.0[1]		10.1[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 total (short and long term) 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 1.3 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 77,659 firm-year observations of which 19.0% have a debt rating. Panel B contains only firm years where the firm had a positive amount of debt. In Panel B, there are 69,589 firm-year observations of which 21.1% 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

	Access	No Access	Difference
Log(Market Value of Assets)	7.74	4.56	3.18[1]
	7.69	4.47	3.22[1]
Log(Book Value of Assets)	7.41	4.11	3.30[1]
	7.34	4.06	3.29[1]
Log of Sales	7.21	4.11	3.10[1]
	7.22	4.10	3.12[1]
Log (1 + Firm age)	2.61	1.83	0.78[1]
	2.89	1.95	0.94[1]
Profit Margin (%)	16.23	2.4	13.83[1]
	14.51	8.08	6.43[1]
Plant, Property, & Equipment/	42.39	30.84	11.55[1]
Assets (BV) (%)	38.63	24.35	14.28[1]
Market Value of Assets/	1.59	1.88	-0.30[1]
Book Value of Assets (%)	1.30	1.36	-0.06[1]
R&D / Sales (%)	1.77	6.11	-4.34[1]
	0.00	0.00	0.00
Advertising / Sales (%)	1.11	1.31	-0.20[1]
	0.00	0.00	0.00
Marginal Tax Rate (%)	32.61	26.46	6.15[1]
(before interest expense)	34.99	34.00	1.00[1]
Equity Return previous year (%)	13.35	10.97	2.38[1]
	9.02	-1.33	10.35[1]
Implied Asset Volatility (%)	18.89	40.73	-21.84[1]
	16.13	34.19	-18.06[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 Access; those without a bond rating are classified as having No Access. Missing values for R&D and Advertising Expense are set equal to zero. The Market-to-Book Ratio and the Implied Asset Volatility variables are truncated at the 1st and 99th percentiles.

Table III: Maturity of Debt by Bond Market Access

	1	2	3	4	5	>5
Total Sample	32.7	11.6	8.8	6.6	5.6	34.8
	20.5	4.6	3.2	1.6	0.4	24.6
Bond Market Access	16.4	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	28.3
	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]	50.3[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 columns 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	V
Firm has a debt rating (1 = yes)	0.083[1] (0.005)	0.080[1] (0.006)	0.078[1] (0.005)	0.078[1] (0.004)	0.071[1] (0.004)
Ln(Market assets)	-0.010[1] (0.001)	-0.010[1] (0.001)	-0.007[1] (0.001)	-0.025[1] (0.001)	-0.026[1] (0.001)
Ln(1 + Firm age)	-0.007[1] (0.001)	-0.007[1] (0.001)	-0.014[1] (0.002)	-0.016[1] (0.001)	-0.016[1] (0.001)
Profits / Sales	-0.067[1] (0.007)	-0.075[1] (0.009)	-0.056[1] (0.009)	-0.073[1] (0.006)	-0.074[1] (0.006)
Tangible assets	0.151[1] (0.008)	0.151[1] (0.007)	0.131[1] (0.009)	0.129[1] (0.007)	0.116[1] (0.007)
Market to book (Assets)	-0.040[1] (0.001)	-0.044[1] (0.002)	-0.047[1] (0.001)	-0.020[1] (0.001)	-0.019[1] (0.001)
R&D / Sales	-0.180[1] (0.009)	-0.195[1] (0.014)	-0.198[1] (0.011)	-0.079[1] (0.007)	-0.083[1] (0.007)
Advertising / Sales	-0.116[1] (0.024)	-0.070[5] (0.024)	-0.071 (0.045)	-0.036[10] (0.022)	-0.036[10] (0.021)
Marginal tax rate			-0.139[1] (0.014)		
Stock return previous year				-0.006[1] (0.001)	-0.008[1] (0.001)
σ (Asset return)				-0.334[1] (0.009)	-0.326[1] (0.009)
% of debt due in $\leq$ 1 year					-0.027[1] (0.004)
% of debt due in > 5 years					0.026[1] (0.004)
# of Observations	63272	63272	48021	59562	59562
R^2	0.242	0.230	0.242	0.368	0.373

Notes:

The dependent variable is the ratio of total 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 (White, 1980 and Rogers, 1993), except in column II. The coefficients and standard errors are estimated using the Fama-MacBeth (1973). 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)	0.068[1]	0.139[1]	0.051[1]	0.090[1]	0.041[1]
	(0.002)	(0.030)	(0.002)	(0.005)	(0.003)
Ln(Market assets)	-0.025[1]	-0.041[1]	-0.006[1]	-0.022[1]	0.011[1]
	(0.000)	(0.006)	(0.001)	(0.001)	(0.002)
Ln(1 + Firm age)	-0.009[1]	-0.077[1]	0.037[1]	-0.023[1]	0.041[1]
	(0.001)	(0.008)	(0.001)	(0.002)	(0.002)
Profits / Sales	-0.072[1]	-0.002	-0.055[1]	-0.073[1]	-0.044[1]
	(0.003)	(0.046)	(0.004)	(0.006)	(0.004)
Tangible assets	0.122[1]	0.097[1]	0.160[1]	0.130[1]	0.119[1]
	(0.004)	(0.022)	(0.006)	(0.006)	(0.009)
Market to book (Assets)	-0.020[1]	-0.004	-0.018[1]	-0.016[1]	-0.015[1]
	(0.001)	(0.009)	(0.001)	(0.001)	(0.001)
R&D / Sales	-0.053[1]	0.178[5]	-0.047[1]	-0.060[1]	-0.028[1]
	(0.006)	(0.076)	(0.009)	(0.009)	(0.008)
Advertising / Sales	-0.034[5]	-0.145	-0.033	-0.026	-0.018
	(0.014)	(0.186)	(0.020)	(0.020)	(0.021)
Stock return previous year	-0.008[1]	-0.072[10]	-0.017[1]	-0.005	-0.020[1]
	(0.001)	(0.039)	(0.001)	(0.004)	(0.001)
σ (Asset return)	-0.311[1]	-0.682[1]	-0.232[1]	-0.359[1]	-0.185[1]
	(0.003)	(0.054)	(0.003)	(0.007)	(0.004)
# of Observations	59562	59562	59562	59562	49742
R^2	0.442	0.612	0.763	0.465	0.272
Controls	Industry	Industry	Firm	Firm	Firm
Estimation Method	Within	Between	Within	Between	Changes

Notes:

The dependent variable is the ratio of total 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 396 distinct 4 digit SIC industry dummies. The reported R^2 includes the explanatory power of the industry dummies. The R^2 is 0.288 if we exclude the explanatory power of the industry dummies.

Column II - Between industry estimates. The coefficients are estimated based on differences 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 9,742 distinct firms. The reported R^2 includes the explanatory power of the firm dummies. The R^2 is 0.266 if we do not include the explanatory power of the firm dummies.

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

Column V – Estimates are based on first differences in all variables. The coefficients are based on annual changes in the independent variables.

Table VI: Determinants of Interest Coverage
Firm Characteristics

	I	II	III	IV	V
Firm has a debt rating (1 = yes)	-0.650[1] (0.015)	-0.560[1] (0.016)	-0.646[1] (0.015)	-0.586[1] (0.016)	-0.658[1] (0.016)
Ln(Market assets)	0.105[1] (0.003)	0.019[1] (0.004)	0.137[1] (0.004)	0.144[1] (0.004)	0.147[1] (0.004)
Ln(1 + Firm age)	0.127[1] (0.005)	0.111[1] (0.006)	0.148[1] (0.005)	0.145[1] (0.005)	0.150[1] (0.006)
Profits / Sales	5.639[1] (0.040)	4.406[1] (0.045)	5.554[1] (0.041)	5.591[1] (0.041)	6.145[1] (0.042)
Tangible assets	-1.345[1] (0.025)	-0.914[1] (0.026)	-1.316[1] (0.025)	-1.261[1] (0.025)	-1.399[1] (0.026)
Market to book (Assets)	0.150[1] (0.005)	0.225[1] (0.005)	0.090[1] (0.005)	0.086[1] (0.005)	0.069[1] (0.006)
R&D / Sales	-0.810[1] (0.084)	-0.169[10] (0.089)	-1.308[1] (0.089)	-1.307[1] (0.089)	-1.677[1] (0.093)
Advertising / Sales	-0.768[1] (0.176)	-0.555[1] (0.187)	-0.783[1] (0.178)	-0.729[1] (0.178)	-0.941[1] (0.187)
Marginal tax rate		5.011[1] (0.061)			
Stock return previous year			0.105[1] (0.009)	0.110[1] (0.009)	0.137[1] (0.010)
σ (Asset return)			0.800[1] (0.030)	0.755[1] (0.030)	0.702[1] (0.031)
% of debt due in ≤ 1 year				0.018 (0.021)	
% of debt due in > 5 years				-0.323[1] (0.019)	
# of Observations	60701	47063	57127	57127	57127
Censored observations (%)	17.4	15.9	17.0	17.0	15.1
Pseudo R^2	0.181	0.214	0.187	0.189	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 re-coded 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)]. The percent of observations which are censored are reported in the table. White heteroscedastic consistent errors, corrected for correlation across observations of a given firm, are reported in parenthesis (White, 1980 and Rogers, 1993). 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		0.550[1]	0.555[1]	0.551[1]	0.562[1]	0.599[1]
		(0.081)	(0.081)	(0.081)	(0.081)	(0.080)
Firm trades on the NYSE		0.134[1]	0.137[1]	0.135[1]	0.139[1]	0.121[1]
		(0.044)	(0.044)	(0.044)	(0.044)	(0.043)
Log(1+Pr[Rating])			0.300[10]		0.308[5]	0.324[5]
(% of other firms in industry)			(0.156)		(0.155)	(0.155)
Log(1+Pr[Rating])				0.128		
(% of other assets in industry)				(0.099)		
Firm is young					-0.076	-0.071
(age ≤ 3)					(0.048)	(0.048)
Firm is small						-0.425[1]
17.3% MV Asset < Leh min						(0.049)
Ln(Market assets)	0.547[1]	0.490[1]	0.484[1]	0.488[1]	0.485[1]	0.405[1]
	(0.018)	(0.019)	(0.019)	(0.019)	(0.019)	(0.022)
Ln(1 + Firm age)	0.132[1]	0.075[1]	0.076[1]	0.075[1]	0.051[10]	0.056[5]
	(0.017)	(0.018)	(0.018)	(0.018)	(0.027)	(0.027)
Profits / Sales	-0.240[1]	-0.242[1]	-0.220[5]	-0.241[1]	-0.224[5]	-0.220[5]
	(0.090)	(0.088)	(0.088)	(0.088)	(0.088)	(0.089)
Tangible assets	0.168[5]	0.165[5]	0.127	0.153[10]	0.124	0.120
	(0.084)	(0.083)	(0.084)	(0.084)	(0.084)	(0.084)
Market to book (Assets)	-0.153[1]	-0.158[1]	-0.155[1]	-0.157[1]	-0.155[1]	-0.161[1]
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Advertising / Sales	0.781[5]	0.619	0.634[10]	0.595	0.643[10]	0.635
	(0.379)	(0.383)	(0.380)	(0.385)	(0.381)	(0.387)
σ (Asset return)	-1.730[1]	-1.787[1]	-1.743[1]	-1.781[1]	-1.747[1]	-1.751[1]
	(0.126)	(0.128)	(0.129)	(0.128)	(0.130)	(0.131)
# of Observations	59562	59562	59562	59558	59562	59562
Pseudo R^2	0.459	0.466	0.466	0.466	0.466	0.471
F-statistic ($\beta_{Instruments} = 0$)		54.3[1]	59.0[1]	57.6[1]	61.5[1]	125.8[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 (White, 1980 and Rogers, 1993). The Pseudo-R^2 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 percentage of firms in the same 3 digit SIC industry have a bond rating, 4) log of one plus the percentage of firms in the same 3 digit SIC industry have a bond rating weighted by the market value of assets, 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 (0.183) 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.

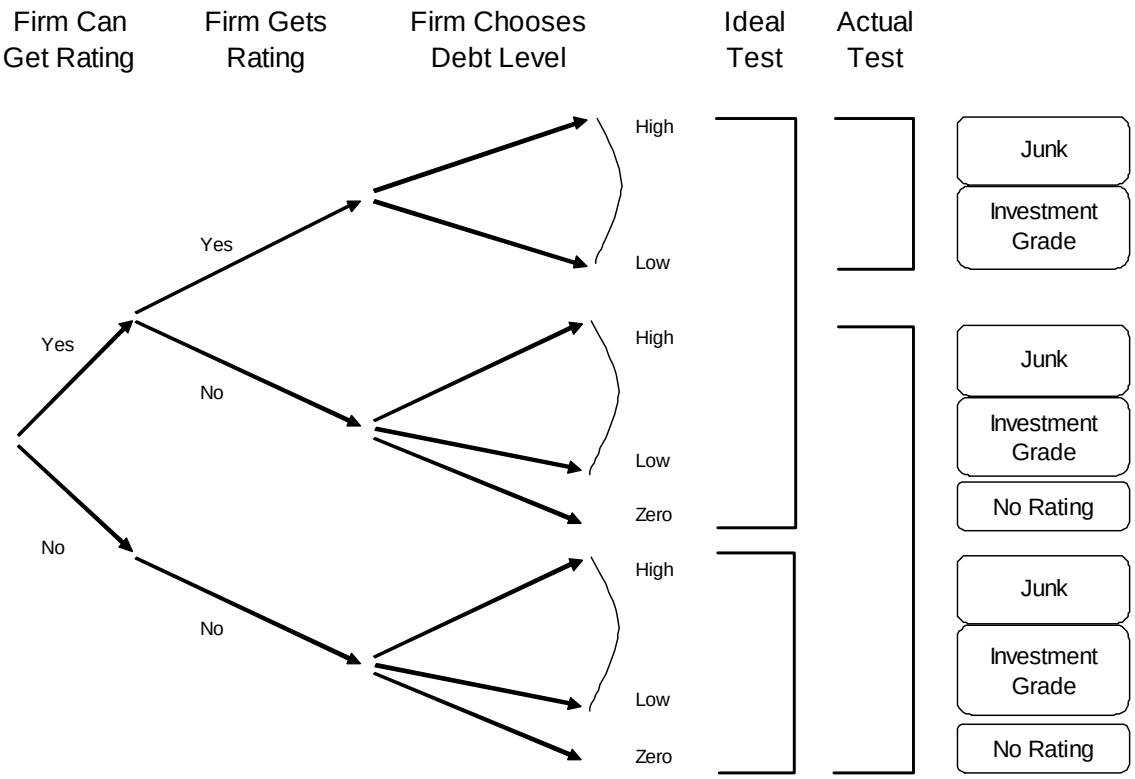
Table VIII: Determinants of Market Leverage
(Second Stage of Instrumental Variable Regression)

	I	II	III	IV	V	VI	VII
Firm has a debt rating (1 = yes)	0.078[1]	0.059[1]	0.061[1]	0.060[1]	0.063[1]	0.057[1]	0.065[1]
	(0.004)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)
Ln(Market assets)	-0.025[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)	-0.016[1]	-0.016[1]	-0.016[1]	-0.016[1]	-0.016[1]	-0.015[1]	-0.016[1]
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Profits / Sales	-0.073[1]	-0.075[1]	-0.074[1]	-0.075[1]	-0.074[1]	-0.075[1]	-0.080[1]
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Tangible assets	0.129[1]	0.130[1]	0.130[1]	0.130[1]	0.130[1]	0.130[1]	0.142[1]
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Market to book (Assets)	-0.020[1]	-0.020[1]	-0.020[1]	-0.020[1]	-0.020[1]	-0.020[1]	-0.016[1]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
R&D / Sales	-0.079[1]	-0.081[1]	-0.081[1]	-0.081[1]	-0.081[1]	-0.082[1]	-0.089[1]
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)
Advertising / Sales	-0.036[10]	-0.035	-0.035	-0.035	-0.035	-0.035	-0.058[1]
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.019)
Stock return previous year	-0.006[1]	-0.007[1]	-0.007[1]	-0.007[1]	-0.007[1]	-0.007[1]	-0.005[1]
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
σ (Asset return)	-0.334[1]	-0.334[1]	-0.334[1]	-0.334[1]	-0.334[1]	-0.334[1]	-0.322[1]
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)
# of Observations	59562	59562	59562	59558	59562	59562	66537
R^2	0.368	0.367	0.367	0.367	0.367	0.367	0.373
Estimation Method	OLS	IV	IV	IV	IV	IV	IV

Notes:

The table contains instrumental variable estimates, except for column I which contains OLS estimates from Table IV, column I. 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 for all firms, not just those with positive debt. We then included the firms with zero debt in the second stage IV estimation. 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 the market value of assets, 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 (0.183) 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 (White, 1980 and Rogers, 1993). 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.

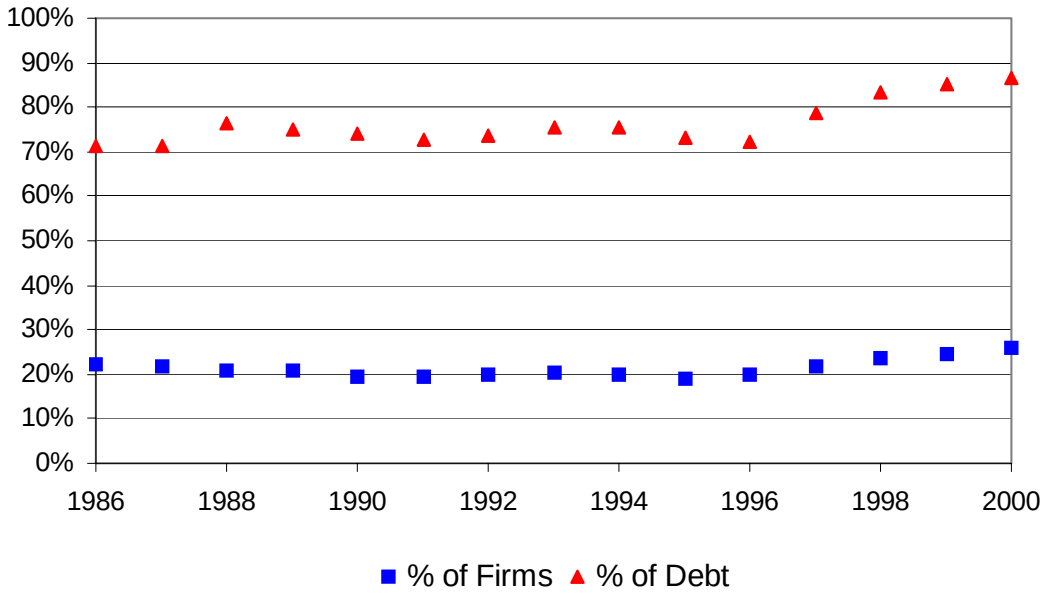
Figure 1: Bond Market Access, Bond Rating, and Leverage



Note:

The figure describes the path of decisions available to the firm. First the firm either has access to the bond market or does not. We can not directly observe this classification. Firms which have access to the bond market then choose to issue public bonds and get a debt rating or not. Then conditional on their bond market access and whether they have chosen to issue public bonds, they choose their leverage. Finally, based on the firm's leverage and their characteristics, the firm receives a debt rating, but only if they have issued public bonds (see Molina (2002) for an empirical test of this relationship). We have diagramed the rating a firm could expect if they do not issue public bonds, but this hypothetical rating is not observable.

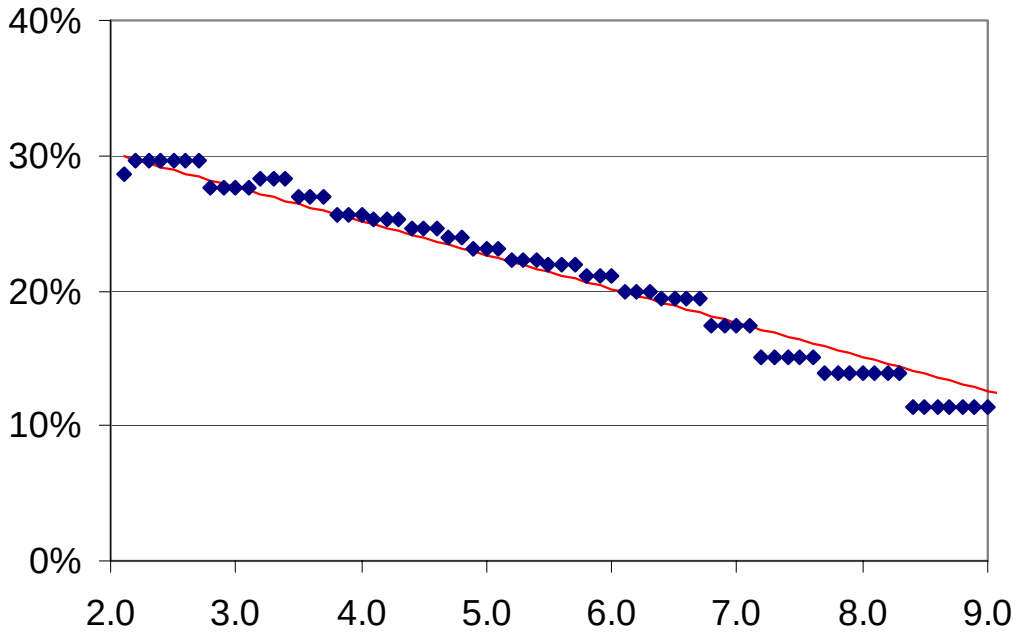
Figure 2: Percent of Firms or Debt with a Debt Rating



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.

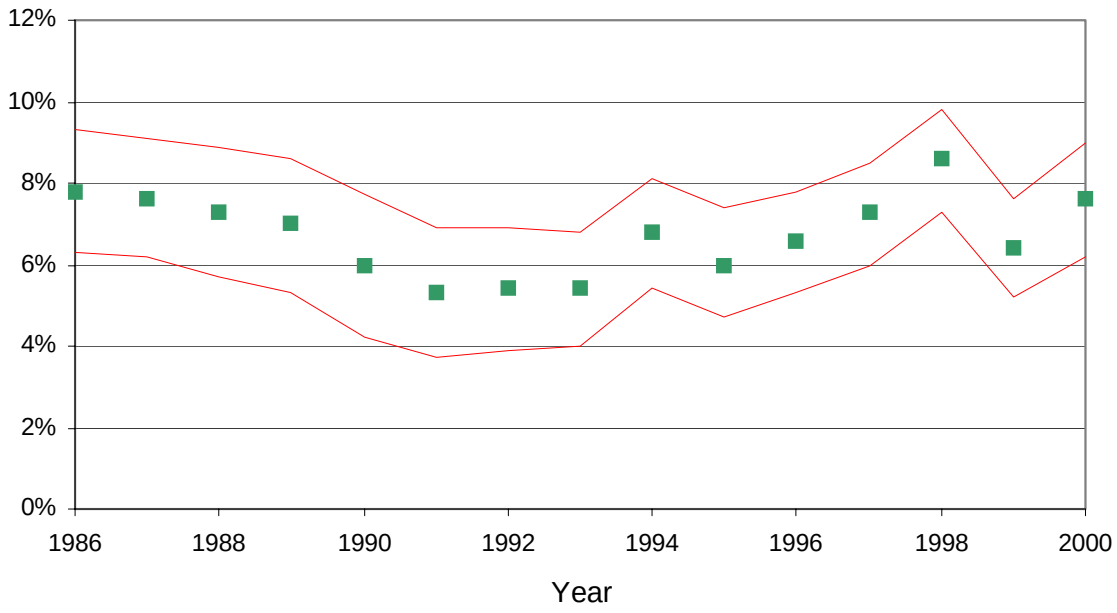
Figure 3: Effect of Firm Size on Leverage
Semi-parametric approach



Note:

The figure graphs predicted leverage as a function of firm size (log of the market value of assets). The straight line is the predicted distance based on the coefficient estimates in Table IV, column IV. We then estimated a second model where the log of the market value of assets is replaced by twenty dummy variables, one for each of twenty vigintiles based on the firm's market value of assets. The diamonds graph the predicted leverage as a function of firm size based on the second model.

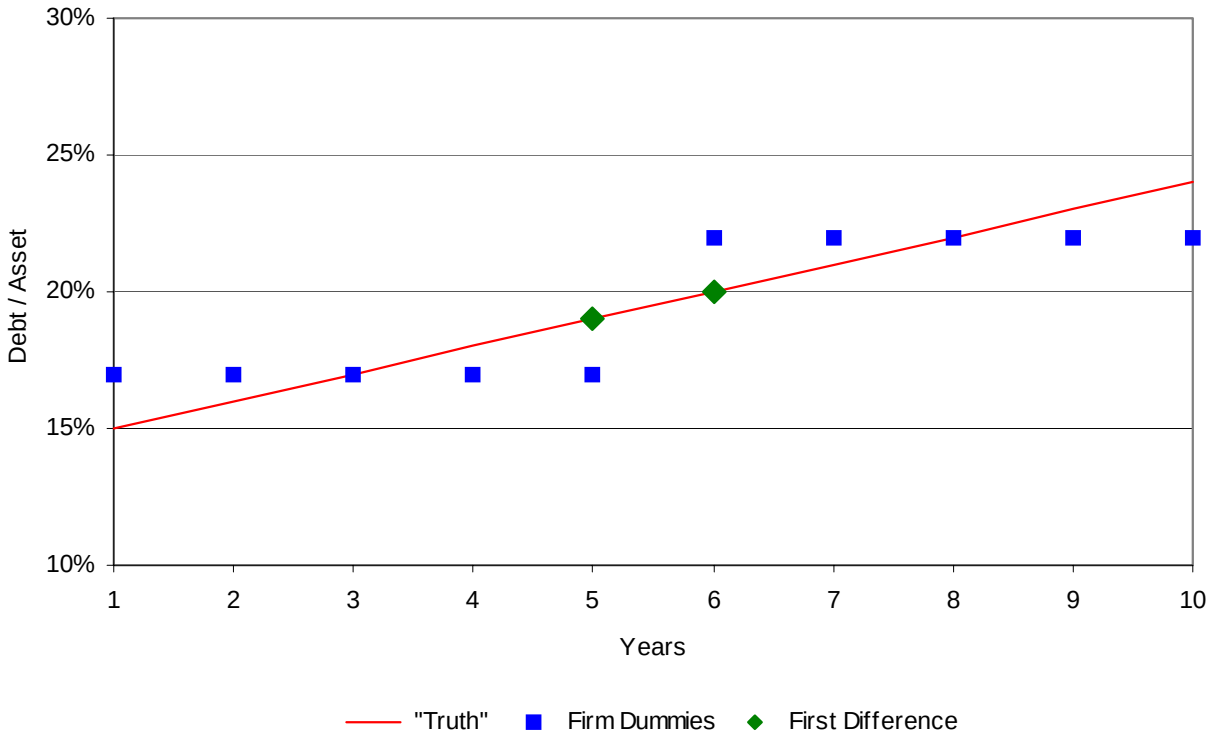
Figure 4: Effect of Rating on Leverage
Time Variation



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 IV. The lines denote the 99 percent confidence interval around the estimates.

Figure 5: 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 illustration, the firm's desired but unobserved 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 IV 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 (22.5 - 17.5). 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 (20.0 - 19.0). Since the change in the desired debt ratio rises slowly (the line), the difference coefficient is only 20% of the within coefficient (0.20 = 1%/5%).