Are Bond Markets the Answer for Only an Elite Few? Evidence from Four U.S. Crises

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Abstract

To what extent do firms switch to bonds when bank credit supply falls, and how are their real outcomes affected? Examining four U.S. crises during 1988-2011 shows that only 8.4% of debt-demanding public firms broke their reliance on loans and switched to bonds. These were high quality firms and, despite incurring large costs, did not suffer significantly more in their output, investment, and employment than predominantly bond-issuing firms. Most firms either received loans, or no debt, and fared significantly worse. Thus, even large firms do not widely substitute loans for bonds, and remain vulnerable to bank health fluctuations.
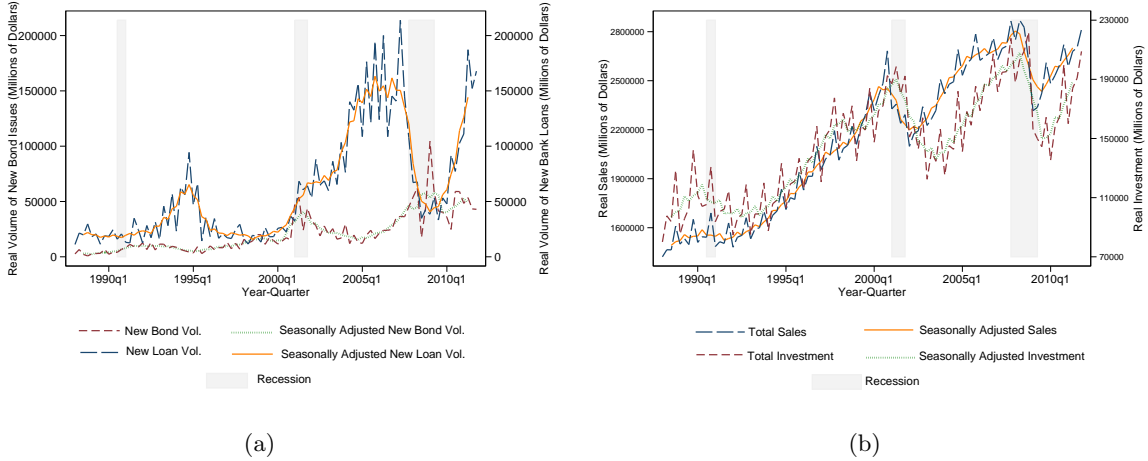
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1   Introduction

Figure 1: Evolution of Debt, Sales, and Investment of Large Firms[a]

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[a]Source: Compustat, DealScan, Thomson One Banker. Figure 1(a) aggregates new debt obtained by all firms that either received loans or issued bonds in a given quarter. Figure 1(b) aggregates quarterly sales and investment for all firms that received some form of credit at least once during 1988:Q1-2011:Q4. Section 2 provides greater detail on sample selection criteria. All series are in millions of dollars and deflated by U.S. CPI (2010=1). Seasonally adjusted series are calculated by taking moving averages over the current, two previous, and two forward quarters. Recession quarters follow NBER dates.

Bank lending to all U.S. firms was severely disrupted during the Great Recession, with large publicly traded firms witnessing a 75% drop in new loans between 2007:Q2 and 2009:Q2 (see Figure 1(a)). This decline was mainly driven by shrinking credit supply.[1] Yet, large firms suffered relatively modest declines in investment, output, and employment, with the negative effects of the credit disruption being concentrated in small and medium-sized firms. During 2007:Q2-2009:Q2, large firms' real sales and investment fell 13.4% and 23%, respectively (Figure 1(b)). Employment in these firms also dropped 6.4%. However, the declines in investment and employment witnessed by these firms accounted for only 9.5% and 33% of the economy-wide decrease in each, respectively, with the rest of the decline mainly accounted for by smaller firms.

Thus far, few studies have examined why large firms remained relatively unaffected by the crisis. Chodorow-Reich (2014) finds that large firms that *could* access bond markets as an alternative source of debt suffered insignificant drops in employment.[2] Karabarbounis (2015) finds that large firms did not suffer a substantial decrease in investment, and conjectures that

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[1]Ivashina and Scharfstein (2010) and Adrian et al. (2013).

[2]Chodorow-Reich (2014) identifies firms with access to bond markets as either rated firms or those who ever issued any bonds as listed in the Mergent FISD database.

the reason is that large firms have several other financing options. De Fiore and Uhlig (2015) develop a theoretical model that shows that when firms can easily substitute between loans and bonds, they potentially experience only small drops in output and investment even when bank lending contracts sharply. Another model developed by Crouzet (2016) predicts that firms switching from loans to bonds can still witness an investment drop since they may switch less than proportionately.

How many and what kind of large firms *actually* switch to bonds when bank credit supply falls? How do their real outcomes compare to those who do not switch? In this paper, we provide the first empirical investigation into these questions using data for U.S. firms over the last four financial crises during 1988-2011. We show that during the last three recessions (and an additional credit crisis in 1998), approximately 8% of debt-demanding firms switched from obtaining bank loans to issuing bonds. These were high quality firms that suffered insignificant drops in their real outcomes relative to firms that predominantly issued bonds even before the crises. The vast majority of large firms either received bank loans or no debt at all during these downturns and witnessed relatively larger declines in their real outcomes. Thus, the bond market is still accessed only by a small and select group of firms despite its growth over time.[3] This evidence provides caution against overstating the role played by the bond market in alleviating the negative real consequences of credit crises. Most public firms rely on banks for their credit needs, tying their outcomes to the health of the banking sector.

Our finding of only a small and select group of firms switching from primarily relying on loans to bond issuance during crises is consistent with the large literature that shows that firms face tradeoffs in choosing between the two forms of debt. While a loan is issued by a bank that provides intermediation services (screening, monitoring, flexibility to renegotiate terms, etc.), a bond is held by a dispersed group of investors that cannot provide such services. Of course, firms incur costs for these bank services, making loans more expensive than bonds, in general. This tradeoff between the costs and benefits of financial intermediation implies that firms systematically sort into one form of debt or the other, based on their valuation of bank services. Firms that value these services less – generally larger, higher quality, and lower risk

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[3]As Figure 1(a) shows, during the Great Recession, firms obtained 59% greater market debt through new bond issues. This is substantially more than the volume of debt raised in bond markets previously.

firms[4] – choose to issue bonds over obtaining loans. While the tradeoff between the costs and benefits of financial intermediation might change in crisis, leading more firms to issue bonds, our results indicate that it is still only exceptionally high quality firms that in fact access the public debt market.

Remarkably, we also find that firms that switch from loans to bonds during crises incur a high cost of doing so. This cost increase is greater than the increase witnessed by similar firms that make the switch during normal times. It is also higher than the rise seen during crises by firms that obtain loans as well as bond-issuing firms that are predominantly bond issuers even otherwise. Why did these firms make such a costly switch to bonds? Three pieces of evidence indicate that it is not immediately obvious that firms that switched to bonds when banking sector health deteriorated were "forced" to do so by their inability to obtain loans. First, switching firms are larger and higher quality firms with higher credit ratings than firms that take loans during crises. Thus, it is unlikely that they switched to bonds because loans became more expensive for them than for others, or because they could not receive loans from different banks even if their relationship banks were adversely hit by the crisis. Second, switching firms are considerably more likely to issue bonds post-crises than non-switching firms. Their subsequent post-crisis bond issues also see larger drops in costs than for firms that traditionally issue bonds, suggesting that the cost reduction is not entirely attributable to the end of the crisis. Third, these firms are able to absorb the high cost of debt and do not suffer in their real outcomes. We infer, therefore, that firm financing decisions are based on forward-looking dynamic optimization that makes it optimal for high quality bank-dependent firms to switch to bonds even if the initial cost is high. In section 8, we offer a potential explanation for why such firms may make the switch during crises rather than in normal times.

We build our dataset for the period 1988:Q1-2011:Q4, spanning three (NBER) recessions and another short financial crisis as identified by Berger and Bouwman (2013).[5] Data on publicly traded firms (Compustat) are combined with information about their debt, either as bank loans (LPC DealScan) or as bond issues (Thomson One Banker). Following Becker and Ivashina (2014), we include only those firms that have positive credit demand in a quarter,

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[4]See, for example, Rauh and Sufi (2010).

[5]Three recessions over the sample period occurred during 1990:Q2-1991:Q1, 2001:Q1-2001:Q4, and 2007:Q4-2009:Q2. Berger and Bouwman (2013) identify an additional crisis during 1998:Q3-1998:Q4.

measured as those who either issued market debt or obtained loans.[6] Conditioning our sample on firms with a positive demand for debt enables us to isolate the impact of credit supply shocks on firm outcomes from concurrent effects of changes in credit demand.

We conduct our analysis in four steps, with four key takeaways. First, we examine whether firms' choice between bank loans and bonds is affected by a credit supply shock. Consistent with previous evidence,[7] we find a 7% increase in the likelihood of debt-demanding firms issuing bonds during crises. Among the greater number of bond-issuing firms are those that predominantly obtained bank loans in the past – the switchers. We refer to this group of firms as the loan-bond (LB) group. However, a large fraction of bond-issuing firms during crises are those that mainly issued bonds even previously – the bond-bond (BB) group. Together, these two groups of firms constitute about 15% of all large firms that issue some form of debt during crises. Nearly 85% of debt issuing firms are those that predominantly obtained bank loans in the past and do the same in periods of crises – the loan-loan (LL) group.[8]

Second, we compare the contract terms of bonds and bank loans and find that, although cheaper in normal times, bonds become more expensive than bank loans during crises, with their spreads rising by 78 basis points (44%) compared to a 20 basis point (10%) increase in the cost of bank loans.[9] The maturity of bond issues also falls more than that of bank loans. In absolute terms, bond maturities fall by 28 months compared to a drop of 8 months for loans. LB firms incur the highest cost of debt, which rises 86% compared to switchers in normal times, and is nearly three times the cost of their previous bank loan. This indicates that LB firms pay a premium (which is steeper during a crisis) for not having a long history of bond issues. The small number of switching firms, and the high costs of switching incurred by them demonstrates that firms do not widely substitute between bonds and bank loans, even if they have access to bond markets.

Next, we examine the characteristics of the switching firms (LB) and compare them to those of BB and LL firms. This analysis demonstrates that LB firms are very similar in their

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[6]Consistent with Becker and Ivashina (2014), we find that few firms simultaneously issue debt and obtain a bank loan in the same quarter.

[7]Becker and Ivashina (2014).

[8]A negligible proportion of firms are those that predominantly issued bonds before crises but switched to loans during crises.

[9]This evidence is consistent with the findings of Adrian et al. (2013).

characteristics to BB firms, indicating that firms that switch from predominantly obtaining loans during normal times to issuing bonds during crises are high quality firms. For instance, while BB firms have mean log real assets (in millions USD) worth 9.4, the corresponding value for LB firms is 9.2. On the other hand, LB firms appear quite different from LL firms. LL firms are considerably smaller, with their mean log real assets at 6.1, and are also statistically different from LB firms along several other dimensions. This pattern of differences across the three groups reinforces the takeaway from the previous two results by showing that the bond market serve as a substitute to bank loans for only a select group of high quality firms. We additionally observe that LB firms are much more likely to issue bonds post-crises (42%) relative to LL firms (6%). Moreover, they see a 42% decline in cost compared to 24% for BB firms, again indicating that the high cost of switching during crisis was in large part due to an "unknown" issuer premium.[10] It also suggests that although LB firms incur large costs, switching during crisis may not be a forced or sub-optimal choice for them.

Finally, we shift our focus to the real effects of firms' debt choices during crises. We find that LB firms' output, investment, and employment do not fall significantly more than the declines witnessed by BB firms. While recessions have adverse consequences for all firms' real outcomes, LB firms are not significantly worse off than BB firms. LB firms saw a 0.04 log points greater decline in employment and 0.004 log points larger reduction in sales, but neither is statistically different from zero. Investment in these firms did fall significantly more – between 0.1 and 0.2 log points, depending on specification, although this result is not robust. In contrast, LL firms suffer significantly larger drops in their output, investment, and employment than both BB and LB firms. However, they are better off relative to firms that did not obtain any form of debt during these downturns (the no credit group, NC). Further, propensity score matching (PSM) analysis shows that LB firms' outcomes are also statistically indistinguishable from those of high quality LL firms that are observationally equivalent to LB firms. We take this evidence to indicate that only firms that have reached a a certain threshold level of quality actually switch to bonds when bank lending supply is disrupted. Since these firms are of high quality, they are able to absorb the higher cost of issuing bonds in crises and do not witness significantly greater

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[10]Since the switching firms do not have a long or recent history of bond issuance, they may be unfamiliar to potential investors when they newly issue bonds in a given quarter. This unfamiliarity may necessitate switching firms to incur higher cost of debt.

negative real effects compared to BB firms. Similarly, the PSM analysis shows that they do not fare significantly better than other high quality LL firms that are able to obtain bank loans in crises, suggesting that firm characteristics and availability of credit, rather than the source of credit itself, drive firms' real outcomes.

Is the absence of large negative real effects for LB firms simply camouflaging alternative strategies that switching firms may have employed to tide over the higher cost of bonds? To investigate this possibility, we examine whether firms experience a drop in their cash holdings, R&D expenditures, and inventories when they switch from loans to bonds during crises. Results from this analysis show that changes in these outcomes for LB firms over the periods of the crises are not statistically different from those experienced by BB, or other high quality LL firms. This is further evidence that switching firms are able to absorb the higher cost of issuing bonds.

Our study adds to the long standing question of whether and to what extent credit disruptions affect real outcomes. A large theoretical literature (Bernanke and Gertler (1989), Holmstrom and Tirole (1997), Kiyotaki and Moore (1997), and Diamond and Rajan (2005)) shows that credit supply significantly impacts economic outcomes. Establishing this empirically has proved challenging since credit is highly pro-cyclical, making it difficult to distinguish changes in credit demand from those in its supply. However, recent studies (Ivashina and Scharfstein (2010), Adrian et al. (2013), and DeYoung et al. (2015)) have been able to distinguish between the two, and show that bank lending decline during the Great Recession was attributable largely to credit supply decline . Studies further demonstrate that this had a significant negative impact on employment (Chodorow-Reich (2014), Popov and Rocholl (2016), Greenstone et al. (2014), Glancy (2016)), investment (Amiti and Weinstein (2013), Garicano and Steinwender (2016), Crouzet (2016)), and output (De Fiore and Uhlig (2015)).[11] Our paper contributes to this literature by highlighting the heterogeneity among firms with respect to their sensitivity to bank credit supply disruptions, even for large, public firms. Our results suggest that even within this set of firms, arguably the least credit constrained, there is great

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[11]Other outcomes have also been examined. See Bassetto et al. (2015) for impact on growth of entrepreneurial firms, Duygan-Bump et al. (2015) for unemployment dynamics, Ramcharan et al. (2016) for consumer credit supply, Lagaras (2014) for corporate innovation, and Siemer (2014) for firm entry. Real outcomes of credit crunch have also been studied in other contexts. See Kalemli-Ozcan et al. (2016), Benmelech et al. (2011), Acharya et al. (2016) and Hansen and Ziebarth (2017).

variation among firms in the sensitivity to bank credit disruptions. We find that while a small group of high quality firms can insulate itself from bank credit supply shocks, the majority of large, public firms are dependent on bank loans.

Our paper also relates to the literature on the determinants of firms' choices between obtaining bank loans and issuing bonds in the public debt market. Several studies show that firms issuing bonds have higher credit quality than those relying on bank loans (see Diamond (1991), Denis and Mihov (2003), Bolton and Freixas (2000), Rauh and Sufi (2010), and De Fiore and Uhlig (2011), among others).[12] We take the evidence presented in this strand of literature as indicative of imperfect substitution between bank and public debt. Our paper contributes to this vein of research by showing how these determinants interact with credit supply conditions to affect firms' debt choices. We further show that the imperfect substitution between bank loans and public debt entails differences in costs incurred by the borrowing firms as well as their real outcomes.

The rest of the paper is organized as follows. In section 2, we provide an overview of our data sources. Section 3 presents evidence establishing that only a small group of firms switch to bonds during crises. Section 4 reveals that firms that switch from loans to bonds incur higher costs of debt. Section 5 shows that this group (LB) is constituted by high quality firms. In section 6, we show that over the last four crises, bond-issuing firms witnessed smaller negative effects on their real outcomes compared to LL and NC firms. Section 7 examines the robustness of our results to alternative measures of key variables and sample selection criteria. Section 8 concludes.

2   Data and Sample Selection

We construct a dataset of new debt issues, of both loans and bonds, by U.S. firms during the period 1988 to 2011. Our focus on debt *issues*, as opposed to levels of balance sheet debt outstanding, offers several advantages. First, considering only new debt issues allows us to examine variation in contract terms between loan and bond issues in the presence of a bank

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[12]Other factors impacting firms' debt structures include managerial discretion (Denis and Mihov (2003)), managerial incentive compensation (Meneghetti (2012)), corporate governance (Aldamen and Duncan (2012)), and collateral value (Lin (2015)).

credit supply shock. Crucially, we are able to compare debt cost, maturity, and amount between firms and across varying macroeconomic conditions. Further, examining debt issues allows us to analyze the resulting real outcomes of firms depending on the type of debt issued, *conditional on the time of issue*. Finally, examining only quarters in which a firm issues debt allows us to isolate the effects of shocks to credit supply from those to credit demand. In order to understand the effects of a bank credit supply shock on firm outcomes, we must disentangle the change in supply of bank debt from the concurrent change in demand for debt experienced by firms during a financial crisis. We follow Becker and Ivashina (2014) by including in our sample only quarters in which firms have received debt in the form of either bank loans or public bonds issuance. Inclusion in the sample is then conditioned on positive demand for debt since firms observed receiving debt must have had a positive demand for debt. This setup allows us to examine the observed changes in debt issuance, debt contract terms, and real firm outcomes that derive from changes in credit supply and not from changes to firm demand for credit.

To construct our dataset of debt issues, we combine data from three main sources: firm level data from Compustat, loan issue data from Loan Pricing Corporation DealScan (henceforth LPC), and public bond issue data from the Thomson One Banker new issues database.

Our sample selection criteria for firms and issues follows that of Becker and Ivashina (2014), who identify a measure of supply side shifts in bank credit and that of Adrian et al. (2013), who focus on separating demand side and supply side shocks to credit in both the banking sector and public debt markets. We first identify all non-financial Compustat firms incorporated in the United States in all quarters in which they report positive assets. We then identify the subset of these firm-quarters in which new debt, in the form of either bank loan or public bond, is issued. Using the Compustat North America Fundamentals Annual, Fundamentals Quarterly, and Ratings files, we collect firm level balance sheet and income statement variables that measure real outcomes and firm quality. We obtain loan level data from a March 2015 extract of DealScan. These data consist of loan contract information for dollar denominated private syndicated loans made to U.S. corporations over the period 1986 to 2012. The database covers 50-75% of the value of all commercial loans in the U.S. (Chava and Roberts (2008)).[13]

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[13]Chava and Roberts (2008) report that the coverage increased to include an even greater fraction of commercial loans from 1995 onward.

Following Adrian et al. (2013), we include all loans issued over the sample period with non-missing values for the following contract terms: maturity, amount, lender identification, loan cost, loan type, and stated loan purpose. Because of our focus on real outcomes of firms based on the timing of debt and choice of debt type, we limit our loan sample to only those loans whose stated purpose is for real investment activity.[14] We exclude loans issued for the purpose of restructuring and/or acquisition. Finally, we include only loan issues for which the issuing firm can be mapped to Compustat using the 2012 DealScan-Compustat link dataset provided by Chava and Roberts (2008). The resulting loans database includes information on specific loan terms for the new issues, notably loan amount, cost, and maturity. For our main results, we use all loan issues meeting the above criteria; this includes both term loans and revolvers (lines of credit). In robustness tests, we further restrict our loan issue sample to include only term loans.

We obtain data on commercial bond issues from the Thomson One Banker's New Issues database. These data consist of bond issue details for all U.S. public bond dollar denominated issues during the period 1988-2011. Following Adrian et al. (2013), we include in our sample bond issues with non-missing values for the following contract terms: amount, maturity, cost, and stated purpose. Further, mirroring our inclusion criteria for loan issues, we restrict our sample to bonds issued for investment purposes.[15] Finally, we keep only those bond issues for which the borrowing firm can be mapped to Compustat using the CUSIP identifier. We collect specific bond contract terms for these new issues, notably bond amount, cost, and maturity.

Combining the loan and bond data, we are able to identify the population of firms with non-zero demand for debt (either bank debt or public debt) in a given quarter.[16] Our final sample covers 19,557 debt issues (15,986 loan issues and 3,571 bond issues), made by 6,033 unique firms representing 64 unique (2 digit SIC 1987 codes) industries over the 96 quarters in the sample period 1988:Q1 to 2011:Q4.

In order to evaluate our hypotheses relating loan/bond substitution to contract terms and

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[14]Following Adrian et al. (2013), loans for real investment activity are defined as those with stated primary purpose equal to one of the following: capital expenditure, corporate purposes, equipment purchase, infrastructure, real estate, trade finance, or working capital.

[15]Following Adrian et al. (2013), bonds issued for investment purposes are those with stated primary use of proceeds equal to one of the following: buildings, capital expenditures, construction, general corporate purpose, property development, railways, and working capital.

[16]Of course, we are unable to identify firms that demanded either form of credit but were unable to obtain it.

real firm outcomes in the presence of a bank credit supply shock, we require measures of the following: bank credit supply, debt contract terms, firm outcomes, and firm characteristics. We describe these measures below.

Bank Credit Supply Shock Measures

Our identification relies on comparing loan and bond issues in normal times versus times of reduced bank credit supply. To this end, we identify bank credit supply shocks using three variables. Our preferred measure of reduced aggregate bank credit is an indicator taking the value one during financial crises as identified by Berger and Bouwman (2013); we denote this variable $crisis_{BB}$. The Berger-Bouwman measure specifically identifies periods of crisis in the financial sector. We prefer this measure because of its focus on distress in the financial sector specifically, as opposed to other crisis indicators which are based on the timing of the slowdown of the real sector. Our sample period includes four sub-periods of financial crises allowing for a comparison of the causes and consequences of loan/bond substitution between normal and crisis times. Following Berger and Bouwman (2013), we include the following four periods of crisis in our sample: 1) *Credit Crunch* (1990:Q1-1992:Q4), 2) *Russian debt crisis and Long-Term Capital Management bailout* (1998:Q3-1998:Q4), 3) *Bursting of the dot.com bubble and September 11 terrorist attack* (2000:Q2-2002:Q3), and 4)*Sub-prime lending crisis* (2007:Q3-2009:Q4).[17] Two of the crisis periods captured by the $crisis_{BB}$ indicator originated in the banking sector (the credit crunch and the sub-prime lending crisis), while the other two crisis periods originated in other markets, outside of the banking sector. Regardless of the origin of the crisis, all four of these periods witnessed reduced banking sector credit.

We use two additional measures of aggregate banking sector credit supply. The first is an indicator taking the value one during NBER designated recession periods (denoted $crisis_{NBER}$). The second is a continuous bank credit supply measure introduced by Becker and Ivashina (2014). The authors examine the subset of firms which either received new bank loans or issued new bond debt in a given quarter; by revealed preferences these firms demonstrate a positive demand for debt. Conditional on issuing new debt, the authors interpret a debt-demanding

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[17]These crises are identified using a combination of crisis dates used in the literature, financial indicators, newspaper articles, and subjective judgment. For a detailed discussion of dating financial crises, see Chapter 7 of Berger and Bouwman (2015)).

firm switching from loans to bonds as a sign of contraction in bank-credit supply. Indeed, they find that firms are more likely to switch from bank debt to bond debt during economic downturns. To measure the health of the aggregate banking sector, the authors then calculate the percentage of those firms receiving bank loans in the sample of total debt-demanding firms in a given quarter. They find that this aggregate bank credit supply measure is pro-cyclical and has predictive power for bank borrowing by out-of-sample firms. For every quarter t, this measure of aggregate bank health, which we denote BH_t, is defined as follows:

$$BH_t = \frac{\text{\# of debt-demanding firms in quarter } t \text{ receiving loans in quarter } t}{\text{\# of debt-demanding firms in quarter } t} \qquad (2.1)$$

Note that this measure is continuous and is based on a *data driven* identification of the beginning and end of a given bank crisis and not a subjective choice of crisis and non-crisis dates.

Loan and Bond Contract Terms

We examine the effects of loan/bond substitution on debt contract firms, namely cost, amount, and maturity. The cost of debt for loans is defined as the "drawn all-in spread" (henceforth AIS) reported for each loan in the LPC database. The AIS provides a standard measure of the overall cost of a loan and is expressed as a spread (in basis points) over the benchmark London interbank offering rate (LIBOR).[18] For bonds, we obtain cost, defined as the spread (in basis points) between the bond interest rate and the interest rate on the treasury bond of matching maturity, from Thomson One Banker.

In addition to cost, we obtain maturity information, measured in months, for both loan and bond issues from LPC and Thomson One Banker, respectively. Finally, we obtain loan and bond amounts from their respective sources.

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[18]The AIS is defined as the coupon spread, plus any annual fee, plus any up-front fee divided by the maturity of the loan. See Berg et al. (2014) for a detailed explanation of the AIS spread and its merits as a measure of overall loan cost.

Real Firm Outcomes

In our analysis, we also compare the real outcomes of firms with different debt issuing choices. For each debt-issuing firm in our sample, we measure the change in output, investment, and employment experienced over each of the four crisis periods in our sample. Our output measure is quarterly sales, and investment is given by the change in capital stock over a given quarter. Sales and investment quarterly data are obtained from the Compustat Fundamentals Quarterly file. Employment is measured by the total number of employees at a firm, reported at an annual frequency and obtained from the Compustat Fundamentals Annual file. Annual employment is reported at the end of a firm's fiscal year. We obtain annual employment for a calendar year by assigning employment figures to the previous year for firms whose fiscal year ends in months January - June and to the current year for firms whose fiscal year ends in months July - December. All values are adjusted for inflation using the quarterly CPI series; real values are expressed in 2010 dollars.

Beyond output, investment, and employment, we examine additional firm outcome measures and compare them across different types of firms. Specifically, we measure the change in cash holdings, inventory, and spending on R&D. We use quarterly values of these variables, obtained from the Compustat Fundamentals Quarterly file and adjusted for inflation using the quarterly CPI series. We examine the change at the firm level in each of these variables over each of the four crisis periods in the sample.

Firm Characteristics

Several firm characteristics have been found in the literature to systematically affect a firm's choice of debt structure (see, for example, Denis and Mihov (2003) and Rauh and Sufi (2010)). We follow the definitions in Adrian et al. (2013) for measures of these known determinants. We include two proxies for information asymmetry: firm size measured as log of real assets and tangibility, defined as (net property, plant, and equipment) / (total assets). In addition, we include Tobin's Q as a proxy for a firm's investment opportunity. Tobin's Q is calculated as (assets + market value of equity - book value of common equity - deferred taxes) / (total assets). We control for a firm's project quality with measures of credit rating and profitability.

A firm's credit rating is given by converting its S&P Domestic Long Term Issuer Credit Rating to an integer value ranging from 1 for a rating of D to 22 for a rating of AAA. The quarterly credit rating is given by the monthly rating assigned during the last month of each quarter. Profitability is defined as (operating income before depreciation) / (total assets). Finally, we control for firm leverage, defined as (debt in current liabilities + long-term debt) / (total assets). All firm level variables are measured at a quarterly frequency and lagged by one quarter from the quarter of debt issue when included as controls.

Sample summary statistics are shown in Table 1. All dollar values in this table are in nominal terms. The mean firm in our sample has total assets of $6.1 billion, has a cash reserve that makes up 8.3% of assets, investment that makes up 2.0% of assets, and a leverage ratio of .323. At the time of a debt issue, the average bond-issuing firms is larger than the average loan issuing firm ($16.3 billion in assets vs. $3.8 billion, 42,830 employees versus 12,930 employees), holds a smaller percentage of its assets in cash (5.4% versus 8.9%), and has a slightly higher leverage ratio (.355 vs. .316). Panel B of Table 1 displays summary statistics for the observed debt contract terms in our sample of debt issues. Bonds tend to be issued at larger amounts ($464 million vs. $313 million), have longer maturities (158 months vs. 41 months), and have only slightly lower spreads (203 basis points versus 206 basis points). Table 1 also compares average contract terms of loans and bonds in crisis and normal times. The costs of bonds and loans both increase in times of crisis, with bonds increasing by more in relative terms (44% increase in bond spreads vs. 8% increase in loan spreads). The maturities of both bonds and loans decrease in crisis (maturities fall by 28 months for bonds and 7 months for loans).

Table 1: Summary Statistics

Firm Characteristics

	Overall				Bond Issuing Firms				Loan Issuing Firms			
	Observations	Mean	Median	Standard Deviation	Observations	Mean	Median	Standard Deviation	Observations	Mean	Median	Standard Deviation
Assets (millions of USD)	19,557	6,117.45	877.68	22,381.58	3,571	16,297.65	6,575.50	32,441.86	15,986	3,843.37	534.27	18,693.98
Cash (millions of USD)	19,523	362.20	27.90	1,961.07	3,562	886.39	146.00	2,738.08	15,961	245.22	19.61	1,719.40
Cash Ratio (% of assets)	19,504	0.083	0.036	0.122	3,561	0.054	0.025	0.082	15,943	0.089	0.039	0.129
Investment (millions of USD)	18,243	99.71	10.41	336.14	3,191	297.30	105.00	581.30	15,052	57.82	6.11	235.15
Investment Ratio (% of Assets)	18,243	0.020	0.012	0.031	3,191	0.020	0.015	0.023	15,052	0.020	0.011	0.033
Leverage Ratio	18,745	0.323	0.301	0.246	3,393	0.355	0.336	0.157	15,352	0.316	0.288	0.261
Sales (millions of USD)	19,523	1,238.27	202.58	4,404.09	3,569	3,275.09	1,137.83	7,816.22	15,954	782.62	134.90	2,989.23
Total Employees (Thousands)	15,706	17.16	3.00	65.76	2,385	42.83	10.90	117.05	13,516	12.93	2.49	52.51
Tangibility (PPE/Total Assets)	19,460	0.363	0.301	0.258	3,549	0.477	0.501	0.262	15,911	0.338	0.273	0.250
Profitability	18,175	0.030	0.031	0.049	3,405	0.035	0.032	0.023	14,770	0.029	0.031	0.053
Tobin Q	15,334	1.735	1.353	1.331	2,362	1.622	1.345	0.850	12,972	1.756	1.355	1.400

Debt Contract Terms

	Overall				Bond Issues				Loan Issues			
	Observations	Mean	Median	Standard Deviation	Observations	Mean	Median	Standard Deviation	Observations	Mean	Median	Standard Deviation
Amount (millions of USD)	19,557	340.70	125	731.97	3,571	464.02	250	715.32	15,986	313.15	100	732.83
Cost (bps)	19,557	205.64	175	150.27	3,571	203.15	137	182.93	15,986	206.20	180	141.95
Maturity (Months)	19,557	62.12	48	73.37	3,571	157.78	121.8	126.40	15,986	40.75	36	22.75

Debt Contract Terms by State of Economy

Normal Times

	Bond Issues				Loan Issues			
	Observations	Mean	Median	Standard Deviation	Observations	Mean	Median	Standard Deviation
Amount (millions of USD)	2,235	425.59	250	606.49	11,333	342.09	115	720.69
Cost (bps)	2,235	174.40	113	168.31	11,333	201.30	175	138.96
Maturity (Months)	2,235	168.11	121.8	139.94	11,333	42.89	42	22.64

Crisis Times

	Bond Issues				Loan Issues			
	Observations	Mean	Median	Standard Deviation	Observations	Mean	Median	Standard Deviation
Amount (millions of USD)	1,336	528.32	300	863.81	4,653	242.66	55.99	757.04
Cost (bps)	1,336	251.25	185	195.92	4,653	218.15	200	148.30
Maturity (Months)	1,336	140.49	121.68	97.35	4,653	35.54	36	22.17

Notes: This table presents summary statistics for our new debt issues sample. Summary statistics are presented for two types of variables: firm characteristics and debt contract terms. The sample period is 1988:Q1 – 2011:Q4. Firm-quarter observations include any quarter in which a firm issues new debt in the form of either a loan or a bond. Panel A displays summary statistics of firm characteristics averaged over the entire sample period for all issues and broken out separately for loan issues and bond issues. Firm characteristic data is measured quarterly with the exception of employment which is measured annually. Panel B presents summary statistics for debt contract terms over the entire sample period for all issues and broken out separately for loan issues and bond issues. For loan issues, cost is the drawn-all-in spread and for bond issues, cost is the difference between the bond interest rate and the interest rate on the Treasury bond of the same maturity. Panel C presents summary statistics for debt contract terms by the type of debt issue during normal times in the sample period. Panel D presents summary statistics for debt contract terms by the type of debt issued during crisis periods in the sample. Crises are dated according to Berger and Bouwman (2013). Section 2 provides more detail on data sources, sample selection, and variable definitions.

3   Few Firms Switch from Loans to Bonds

Table 2: Choice Between Bank Loans and Public Bonds

	(1)	(2)	(3)	(4)	(5)	(6)
			Dependent Variable: Firm Choice Between Loans and Bonds			
Crisis Measure	BB-Crisis	BB-Crisis	NBER	NBER	Becker-Ivashina Bank Health	Becker-Ivashina Bank Health
Crisis	0.066***	0.069***	0.075***	0.095***	-0.717***	-0.928***
	(0.017)	(0.017)	(0.024)	(0.020)	(0.064)	(0.049)
Size	0.066***	0.037***	0.065***	0.032***	0.061***	0.011**
	(0.003)	(0.006)	(0.003)	(0.006)	(0.003)	(0.005)
Tobin's Q	0.006**	0.002***	0.006**	0.002***	0.006**	0.003***
	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)
Profitability	-0.022	0.110	-0.025	0.107	-0.006	0.256***
	(0.015)	(0.081)	(0.016)	(0.078)	(0.029)	(0.076)
Tangibility	0.121***	0.120**	0.124***	0.126***	0.129***	0.108**
	(0.019)	(0.047)	(0.019)	(0.047)	(0.018)	(0.042)
Leverage	0.007	-0.027	0.009	-0.019	0.013	-0.031
	(0.014)	(0.021)	(0.013)	(0.021)	(0.013)	(0.019)
Constant	-0.328***	-0.149***	-0.306***	-0.107**	0.309***	0.798***
	(0.056)	(0.041)	(0.055)	(0.043)	(0.079)	(0.060)
Industry Fixed Effects	YES		YES		YES	
Firm Fixed Effects		YES		YES		YES
Observations	13,356	13,356	13,356	13,356	13,356	13,356
Number of Firms		4,714		4,714		4,714
R-squared	0.206	0.015	0.204	0.015	0.225	0.057

Notes: This table presents coefficient estimates from linear probability regression models of the likelihood of firms issuing bonds versus obtaining bank loans during crises and normal times. All firm-quarter observations in which a firm issues new debt are included. The dependent variable equals 1 if a firm issued a bond(s) and 0 if it obtained a bank loan(s) in a given quarter. In columns (1) and (2), crisis is measured using an indicator variable that takes the value 1 for quarters of financial crisis as identified by Berger and Bouwman (2013). In columns (3) and (4), crisis is measured by NBER recession indicators. In columns (5) and (6), crisis is measured by a continuous variable representing the ratio of bond issues to the total of loan and bond issues in a given quarter as suggested in Becker and Ivashina (2014). Columns (1), (3), and (5) include industry fixed effects. Columns (2), (4), and (6) include firm fixed effects. Firm size is measured as log of real assets. All firm characteristics are measured in the quarter before the debt issue. The sample is created by combining data from DealScan, ThomsonOne Banker, and Compustat and includes publicly traded firms that issued debt, either as bonds or as bank loans, in a given quarter over the period 1988:Q1-2011:Q4. Section 2 provides more detail about the data sources and construction of the Becker-Ivashina aggregate bank health variable used as a measure of crises. Robust standard errors clustered by quarter are in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

In this first analysis, our objective is to understand whether changes in bank credit supply influence firms' choice of debt type, specifically between loans and bonds. We estimate the following regression using a linear probability model:

$$D_{it} = \beta_0 + \beta_1 C_t + \beta_2 X_{i,t-1} + \eta_i + \epsilon_{it} \tag{3.1}$$

where D_{it} is a binary outcome variable that equals 1 when firm i issues bonds in quarter t, and zero if it obtains a bank loan. C_t represents bank credit availability in quarter t. We use

three measures of this variable – $crisis_{BB,t}$, $crisis_{NBER,t}$, and BH_t. $X_{i,t-1}$ is a vector of time varying firm characteristics as measured in the previous quarter, including size (log assets), Tobin's Q, tangibility, leverage and profitability. In two variants of this model, we include either industry fixed effects, γ_k, or firm fixed effects, η_i. Note that we cannot simultaneously include both firm and industry fixed effects due to collinearity. In all specifications, standard errors are clustered by year-quarter and are corrected for arbitrary heteroskedasticity. The key variable of interest is C_t. The estimated coefficient on C_t provides us a measure of the effect of bank credit availability on the likelihood of firms issuing bonds instead of obtaining loans. Note that in the specifications without firm fixed effects, identification is coming from variation in debt type choices *between* firms. In these specifications, the predicted likelihood can be interpreted as the estimated proportion of debt-demanding firms that issue bonds in a crisis. In specifications with firm fixed effects, identification comes from *within-firm* variation in debt type choice. In these specifications, firms that always issue the same type of debt, either all bonds or all loans, do not provide identification; identification in these specifications comes from firms that deviate from their average debt type choice, or switch from issuing one type of debt to the other.

Table 2 presents results from this linear probability model. Moving across columns, results are presented from regressions using different measures of crises. For each of these measures, two specifications are presented – first with industry fixed effects and second with firm fixed effects. Consistent with the findings of Becker and Ivashina (2014), we see that firms are more likely to issue bonds rather than receiving bank loans during crises. For instance, during crisis (measured using NBER dates), the proportion of debt-demanding firms issuing bonds is estimated to increase by 7.5%. Also consistent with Becker and Ivashina (2014), we find that firms are more likely to switch to issuing bonds in crisis, as evidenced by the positive and significant coefficient on the crisis variable in specifications with firm fixed effects. For example, the coefficient estimates in Table 2, column 4 shows that the likelihood of switching from issuing loans to issuing bonds increases by 9.5%. Note that a reduction in bank credit availability is indicated by a decrease in aggregate bank health. The negative coefficient on this measure (columns 5 and 6) shows that a deterioration in the health of the banking sector is associated with increased likelihood of firms issuing bonds. All firm characteristics, except

leverage, are positively and significantly associated with the likelihood of bond issues by firms. Leverage is not significantly associated with this likelihood.

Regressions presented in Table 2 demonstrate that bond issuance rises during crises. This is driven not only by firms that previously issued mainly bonds but also by those who are otherwise bank dependent for their credit needs and switch to bond issuance in crisis. Yet, the vast majority of debt-demanding firms are and remain bank-dependent. To highlight this point, and to clearly compare the characteristics and outcomes of these different kinds of firms, we classify firms into distinct groups based on their debt choices in crisis and their choices over the preceding five years (twenty quarters): bond-bond (BB), bond-loan (BL), loan-bond (LB), and loan-loan (LL). Group BB (LL) represents firms that issued predominantly bonds (loans), by amount of issue, over the last 20 quarters and continued issuing bonds (loans) during the crisis. Group LB (BL) represents firms that issued predominantly loans (bonds) over the past twenty quarters and switched to bond (loan) issuance during the crisis. Note that firms issuing more than one type of debt during the crisis are excluded, so that only firms issuing uniquely loans or uniquely bonds during crisis periods are classified. Further, if a firm that issues debt more than once in a crisis receives more than one unique group assignment, the group determination is made as follows. If the group assignment is LL for both issues, or BB for both issues, the firm is assigned as LL and BB, respectively. If the assigned group is LL for one issue and LB for the other, then the firm is classified as LB. Finally, if the assigned group is BB for one issue and BL for another, then the firm is classified as BL. If the firm issues debt more than twice during one crisis (this is rare), it is dropped from the analysis. The resulting sample has one observation per firm per crisis. We define these groups analogously for normal times, i.e., firms are classified into a group based on their debt choice in the current quarter (during normal times) compared to their preferred debt choice in the previous twenty quarters.

Table 3 documents the proportions of these four groups during normal times and crisis periods. We observe that over the entire sample period, while 8.8% of debt-demanding firms issue bonds during normal periods, this percentage increases to 13% during crises. Thus, a higher proportion of firms issue bonds during crises. However, only 8.4% firms are LB firms – those that *switch* their debt choice from bank loans before to bonds during crises. The proportion of switchers varies considerably across crises, with the Great Recession seeing the

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Table 3: Percentage of Firms in Various Debt Choice Groups

	Total Number of Firms	% BB	% BL	% LB	% LL
			Overall		
Crises	4220	4.64	4.05	8.36	82.94
Normal Times	5358	2.46	4.97	6.33	86.25
			Crisis: 1990:Q1 - 1992:Q4		
Before Crisis	803	4.11	1.49	0.62	93.77
During Crisis	1332	4.50	1.65	1.80	92.04
			Crisis: 1998:Q3 - 1998:Q4		
Before Crisis	2462	2.68	1.95	4.67	90.70
During Crisis	251	8.76	2.39	13.15	75.70
			Crisis: 2000:Q2 - 2002:Q3		
Before Crisis	579	5.35	3.97	8.98	81.69
During Crisis	1580	4.49	7.47	6.27	81.77
			Crisis: 2007:Q3 - 2009:Q3		
Before Crisis	2317	1.51	8.42	7.42	82.65
During Crisis	1057	4.07	2.37	18.64	74.93

Notes: This table presents proportions of firms in different groups based on their debt choices during crises and normal times. Crises are dated according to Berger and Bouwman (2013). The period before each crisis includes the entire time period between the end of the last and beginning of the current crisis. For the 1990 crisis, the before period begins in 1988:Q1. Group BB (LL) represents firms that issued predominantly bonds (loans), by amount of issue, over the last 20 quarters and continued issuing bonds (loans) for the current issue. Group LB (BL) represents firms that issued predominantly loans (bonds) over the past 20 quarters and switched to bond (loan) issuance for the current issue. Only firms issuing a unique type of debt (only loans or only bonds) during each period (crisis or normal times) are included. The sample is created by combining data from DealScan, ThomsonOne Banker, and Compustat. Sample includes publicly traded firms that issued debt, either as bonds or as bank loans, in a given quarter over the period 1988:Q1-2011:Q4.

highest, at 18.6%. In all crises, the overwhelming majority of debt-demanding firms are LL, i.e., their dominant debt choice before the crisis was bank loans and they continue to receive loans even during the crisis.

Note that our finding that the group of firms that actually accesses the bond market in crisis is small, comprising 13% of debt-demanding firms, differs from the findings of Crouzet (2016) and Rauh and Sufi (2010) that the bond market is a large source of credit for rated firms.[19] We differ from these papers in two crucial ways. First, we consider all large, public

[19]Rauh and Sufi (2010) show that in their sample, the majority of firms (68.3%) use both bank loans and bonds and the rest use bonds exclusively. Crouzet (2016) documents that bonds accounted for 63.0% of the total

firms while Crouzet (2016) and Rauh and Sufi (2010) consider only rated firms. Second, we include only those bond (and loan) issues whose stated purpose is for real investment; we exclude bonds issued for restructuring and/or acquisition. Our inclusion criteria stem from our main questions, which are, to what extent did large firms access the bond market in crisis, and how did this bond issuance affect their real outcomes. Our results suggest that the bond market is much smaller when examined through this lens.

4 Switching Firms Incur High Costs

Next, we examine how the cost of debt changes with crisis and whether the change differs systematically between the four debt type groups. We begin with a univariate analysis of debt cost, comparing raw cost figures in crisis and normal times and between the four debt type groups. Recall that the cost of bank loans is defined as the drawn all-in spread and the cost of bonds is defined as the spread between the bond interest rate and the interest rate on the treasury bond of matching maturity. Table 4 documents how debt cost changes from before to during the crisis for each of the four groups. Crisis periods are dated according to Berger and Bouwman (2013) and pre-crisis periods are defined as the time period between the end of the last crisis and the beginning of the current crisis. Note that for the 1990-1992 crisis, the pre-crisis period begins in 1988:Q1. The values in Table 4 are averages across the four crisis periods and four pre-crisis periods. We focus on the costs for BB, LB, and LL firms and de-emphasize that for BL firms since it is a very small group (see Table 3). Panel A presents comparisons of the costs faced by the four groups before and during crisis. From Panel A, we see that firms in all four groups face higher costs in crisis than pre-crisis. We also see that the cost of bonds increases more than the cost of loans. This is evident when comparing the cost increases on bonds: 73.16 basis points for BB firms and 139.60 basis points for LB firms, to the cost increase on loans: 32.21 basis points. Next, we see that switching firms (LB) face higher costs both before and during crisis than the predominantly bond-issuing group (BB). The average switching firm pays a spread of 163.23 basis points in pre-crisis times versus the average predominantly bond-issuing firm (BB) which pays a spread of only 105.04 basis points.

debt of the non-financial corporate sector on the eve of the Great Recession.

Similarly, in crisis times, switching firms pay a spread of 302.83 basis points on their new bond issues while the average predominantly bond-issuing firm (BB) pays a spread of 178.20 basis points on its repeated bond issue. This difference in bond costs for the switching group versus the group of predominantly bond issues is due to the difference in quality between firms in the two groups; we will show in a later section that BB firms are of slightly higher quality then LB firms. However, we conjecture that the higher cost for the LB firms also reflects an "unknown" issuer premium that switching firms might have to pay for issuing bonds in the absence of a long or recent history of doing so. Further, comparing the before and during crisis averages for the LB group in Panel A shows that switching to bond issuance from predominantly loan issuance in crisis is 85.5% more expensive than switching in normal times, suggesting that crisis exacerbates the "unknown" issuer premium.

Table 4: Average Cost of Debt Before and During Crises

(1)	(2)	(3)	(4)	(5)
Group	Pre-Crisis Cost	Cost During Crisis	Change in Cost	Percentage Change in Cost
Panel A: Average Cost by Debt Choice Group Pre and During Crisis				
BB	105.04	178.20	73.16	69.65
BL	101.70	130.13	28.43	27.95
LB	163.23	302.83	139.60	85.52
LL	191.06	223.27	32.21	16.86
Panel B: Average Cost by Firm Pre and During Crisis				
BB	107.94	195.15	87.21	80.79
BL	188.46	141.05	-47.41	-25.16
LB	81.55	343.15	261.60	320.78
LL	182.90	206.19	23.30	12.74

Notes: This table presents average cost of debt for different groups of firms before and during crisis. Crises are dated according to Berger-Bouwman (2013). The sample period includes four periods of crisis. The pre-crisis period for each crisis includes the entire time period between the end of the last and beginning of the current crisis. For the 1990 crisis, the pre-crisis period starts in 1988:Q1. The cost of bank loans is defined as the drawn all-in spread. For bonds, cost is defined as the spread between the bond interest rate and the interest rate on the treasury bond of matching maturity. Group BB (LL) represents firms that issued predominantly bonds (loans), by amount of issue, over the last 20 quarters and continued issuing bonds (loans) for the current issue. Group LB (BL) represents firms that issued predominantly loans (bonds) over the past 20 quarters and switched to bond (loan) issuance for the current issue. Panel A compares the average cost over all issues by firms in each group during the pre-crisis periods to the average cost over all issues by firms in each group during crisis periods. In Panel B, the pre-crisis and crisis costs are recorded for the same firm and then averaged by firms' debt choice group during crisis. The sample is created by combining data from DealScan, ThomsonOne Banker, and Compustat. Sample includes publicly traded firms that issued debt, either as bonds or as bank loans, in a given quarter over the period 1988:Q1-2011:Q4. Section 2 provides more detail on data sources, sample selection, and variable definitions.
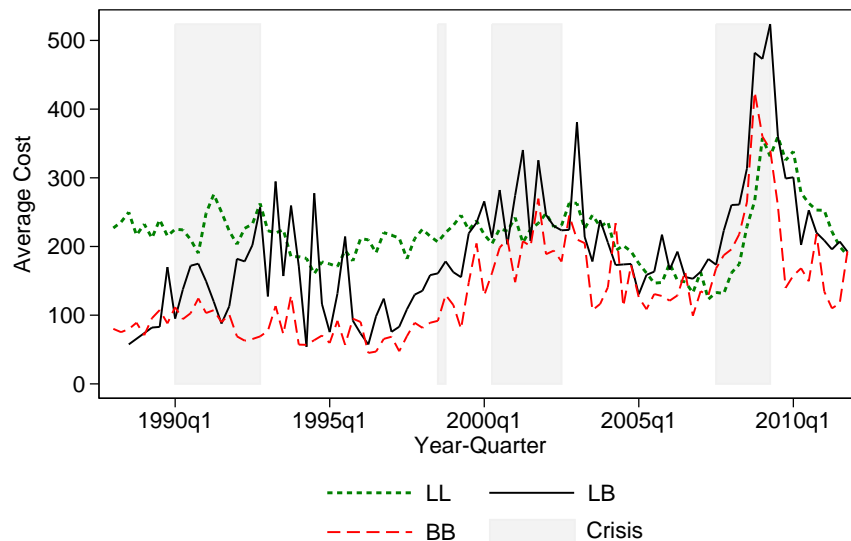
Figure 2: Average Cost by Debt Choice Group[a]

Panel B presents own firm changes in cost between pre-crisis and crisis period debt issues. This eliminates any pre- to during crisis differences in cost due to changing group composition (since the same firms may not issue debt both pre and during crisis).[20] The conclusions from Panel A hold even when controlling for group composition. Firms issuing predominantly bonds saw their own bond-issuing costs rise by 87.21 basis points in crisis. Firms issuing predominantly loans saw their loan costs increase by a smaller amount in crisis: 23.30 basis points.[21] The greatest increase in cost is witnessed by LB firms that switch from bank loans pre-crisis to issuing bonds during crises. Compared to their own loan issues before the crises, switching to bonds during crises entails an astounding 320.8% rise in cost.

Figure 2 shows the relationship between loan and bond costs for each debt type group over the entire sample period. We see that the greater increase in cost for the BB and LB firms

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[20]Note that the group assignment is based on the crisis period debt issue of the firm.

[21]The finding that bond costs increase more during a bank credit supply disruption than loan costs is consistent with De Fiore and Uhlig (2015) who show in a general equilibrium setting that loan costs do not increase as much as bond costs in crisis because a set of lower quality firms that received loans in normal times is shut out of the loan market entirely in crisis, resulting in a higher quality group of firms receiving loans in crisis than in normal times.

than LL firms during crisis entails that loans are costlier than bonds in normal times but that bonds become costlier during crises. Also note that while costs for all groups increase in crisis, the average cost for an LB firm increases the most during crisis periods. Finally, note that debt issuing costs saw the sharpest increase in the 2007-2009 crisis.

Next, we examine how cost changes for the four groups between normal times and crises in a multivariate regression framework that allows us to control for firm characteristics. We estimate regressions of the following form:

$$B_{it} = \beta_0 + \beta_1 G_{it} + \beta_2 C_t + \beta_3 C_t \times G_{it} + \beta_4 X_{i,t-1} + \beta_5 B_{it}^o + \gamma_k + \epsilon_{it} \qquad (4.1)$$

where B_{it} represents cost (spread measured in basis points) of debt and G_{it} is a vector of indicator variables that identify the debt group that the firm belongs to. The estimated coefficients on the interaction term $C_{it} \times G_{it}$ provide measures of the association of firms' debt choices with contract terms in each crisis. We additionally control for contract terms other than the regressand, denoted by B_{it}^o; these include maturity and debt amount. These are included to account for the fact that contract terms are jointly determined. In all specifications, standard errors are clustered by year-quarter and are corrected for arbitrary heteroskedasticity. Results are presented in Table 5. Columns 1-3 present results from specifications using each of the three measures of crises – Berger and Bouwman (2013), NBER, and aggregate bank health based on Becker and Ivashina (2014). Recall from the univariate analysis that in normal times, bonds are more expensive than loans. Notice that this relationship no longer holds when firm characteristics are accounted for. This is evident because the coefficient on LL, which compares the cost in the LL group to the cost in the BB group in normal times, is negative and significant. This evidence suggests that loans are more expensive in normal times because they are issued to lower quality borrowers. The multivariate regression analysis confirms the result that debt costs are highest for the LB group, both in crisis and in normal times. Note that the coefficient on the LB main effect as well as the interaction term between crisis and LB are positive and significant implying that costs for this group are higher than the BB group. Controlling for firm characteristics, bond costs are 39.83 (44.11) basis points higher for switching firms than for the predominantly bond-issuing firms in crisis, and that this gap widens to 84.20 (98.15)

Table 5: Cost Regressions

Crisis Measure	(1) BB	(2) NBER	(3) Becker-Ivashina Bank Health
BL	-44.017***	-46.307***	-155.293**
	(11.168)	(9.614)	(75.931)
LB	39.813***	44.110***	243.457***
	(10.222)	(8.780)	(80.175)
LL	-42.250***	-42.481***	-228.916***
	(9.587)	(8.460)	(70.753)
Crisis	42.076**	106.433***	-535.601***
	(19.937)	(33.006)	(109.172)
BB*Crisis	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
BL*Crisis	-53.095***	-89.469***	132.807
	(16.541)	(22.743)	(90.389)
LB*Crisis	84.201***	98.146***	-255.914**
	(26.975)	(36.247)	(98.015)
LL*Crisis	-40.593**	-84.255***	224.355***
	(15.658)	(22.868)	(84.951)
Size	-23.698***	-23.945***	-26.299***
	(1.768)	(1.608)	(1.434)
Tobin's Q	-5.225*	-4.988*	-4.873*
	(2.967)	(2.820)	(2.778)
Profitability	-92.218	-89.926	-81.849
	(80.428)	(78.749)	(73.115)
Tangibility	-50.761***	-49.772***	-46.542***
	(9.062)	(9.031)	(8.584)
Leverage	157.343***	157.531***	158.069***
	(10.751)	(10.649)	(10.819)
Maturity	-0.181***	-0.168***	-0.151***
	(0.039)	(0.034)	(0.031)
Amount	-9.839***	-10.018***	-8.351***
	(1.604)	(1.550)	(1.623)
Constant	471.551***	471.165***	921.811***
	(34.906)	(33.658)	(96.020)
Industry Fixed Effects	YES	YES	YES
Observations	13,028	13,028	13,028
R-squared	0.287	0.303	0.324

Notes: This table presents coefficient estimates from a panel regression of the cost of debt on firm debt choice type during crises and normal times. All firm-quarter observations in which a firm issues new debt are included. The cost of bank loans is defined as the drawn all-in spread, measured in basis points. For bonds, cost is defined as the spread between the bond interest rate and the interest rate on the treasury bond of matching maturity measured in basis points. Group BB (LL) represents firms that issued predominantly bonds (loans), by amount of issue, over the last 20 quarters and continued issuing bonds (loans) for the current issue. Group LB (BL) represents firms that issued predominantly loans (bonds) over the past 20 quarters and switched to bond (loan) issuance for the current issue. In column (1), crisis is measured using an indicator variable that takes the value 1 for quarters of financial crisis as identified by Berger and Bouwman (2013). In column (2), crisis is measured by the NBER recession indicator. In column (3), crisis is measured by a continuous variable representing the ratio of bond issues to the total of loan and bond issues in a given quarter as suggested in Becker and Ivashina (2014). Firm size is measured as log of real assets. All firm characteristics are measured in the quarter before the debt issue. Industry fixed effects are included. The sample is created by combining data from DealScan, ThomsonOne Banker, and Compustat. Sample includes publicly traded firms that issued debt, either as bonds or as bank loans, in a given quarter over the period 1988:Q1-2011:Q4. Section 2 provides more detail about data sources and construction of aggregate bank health used as a measure of crises. Robust standard errors clustered by quarter are in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

basis points in crisis using the Berger and Bouwman (2013) measure (NBER indicator). The multivariate regression analysis confirms that accounting for differences in firm characteristics, switching to bonds is expensive relative to other debt issues and is even more expensive in crisis times.

5   Switching Firms are of High Quality

Having established that switching LB firms incur high costs, we next compare the characteristics of the LB firms to those of the predominantly bond-issuing (BB) and predominantly loan issuing (LL) firms. Table 6 presents mean firm characteristics by debt type group and makes pairwise statistical comparisons of group means using t tests. Panel A provides results for the full sample period (1988:Q1-2011:Q4) and Panel B provides analogous results over the four crises in the sample period, as identified by Berger and Bouwman (2013). In both panels, we see that BB firms are the largest and LL firms are the smallest in size (in Panel A, the mean log of real assets (in millions USD) is 9.36 for BB firms and 6.33 for LL firms). LB firms fall in between the two groups, with a value of 9 (Panel A), but are much closer to BB than LL. The same pattern holds for credit ratings.[22] A similar relationship also exists between the three firm groups for leverage, tangibility, and Tobin's Q. BB and LB firms are quite similar in their profitability and statistically indistinguishable during crisis periods. Moreover, the already small differences between BB and LB firms become smaller in magnitude during crises, indicating that firms that switch from loans to bonds during periods of adverse bank credit conditions are much more similar to predominantly bond-issuing firms than those that make this switch during normal times.

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[22]For the purpose of this analysis, the ratings have been converted to a numeric scale, with higher numbers denoting higher credit ratings. Thus, for example, a credit rating of 22 refers to an actual rating of AAA, 20 denotes AA, 15 is BBB+, and 10 is BB-.

Table 6: Firm Characteristics by Debt Choice Group

Firm Group	Size		Leverage		Profitability		Tangibility		Tobin's Q		Credit Rating	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Panel A: Average Characteristics Over 1988:Q1-2011:Q4												
BB	9.361	1.214	0.357	0.131	0.034	0.016	0.533	0.251	1.638	0.827	16.048	2.786
LB	8.993	1.336	0.344	0.150	0.036	0.024	0.432	0.263	1.599	0.779	14.333	3.062
LL	6.325	1.983	0.313	0.265	0.029	0.055	0.331	0.248	1.770	1.429	11.953	3.311
	Difference in Means	t Statistic	Difference in Means	t Statistic	Difference in Means	t Statistic	Difference in Means	t Statistic	Difference in Means	t Statistic	Difference in Means	t Statistic
BB - LB	0.368	7.850	0.013	2.526	-0.002	-2.009	0.101	10.662	0.039	1.051	1.715	15.723
LB - LL	2.668	52.815	0.031	4.473	0.007	4.834	0.101	15.463	-0.171	-4.114	2.380	25.439
BB - LL	3.037	55.971	0.044	5.983	0.005	3.487	0.202	28.990	-0.132	-2.543	4.095	42.164
Panel B: Average Characteristics During Crises												
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
BB	9.435	1.201	0.360	0.128	0.033	0.017	0.526	0.237	1.675	0.982	16.335	2.598
LB	9.194	1.289	0.349	0.143	0.034	0.027	0.445	0.260	1.562	0.811	14.801	3.026
LL	6.075	1.970	0.310	0.279	0.025	0.055	0.327	0.249	1.704	1.555	12.076	3.391
	Difference in Means	t Statistic	Difference in Means	t Statistic	Difference in Means	t Statistic	Difference in Means	t Statistic	Difference in Means	t Statistic	Difference in Means	t Statistic
BB - LB	0.241	3.186	0.011	1.295	-0.001	-0.733	0.081	5.348	0.113	1.683	1.534	8.818
LB - LL	3.120	36.896	0.039	3.228	0.009	3.812	0.118	10.608	-0.142	-1.864	2.725	16.515
BB - LL	3.361	38.009	0.050	3.968	0.008	3.242	0.199	17.290	-0.029	-0.317	4.259	25.593

Notes: This table presents average characteristics of firms grouped by their debt choices. Group BB (LL) represents firms that issued predominantly bonds (loans), by amount of issue, over the last 20 quarters and continued issuing bonds (loans) for the current issue. Group LB (BL) represents firms that issued predominantly loans (bonds) over the past 20 quarters and switched to bond (loan) issuance for the current issue. The sample period includes four crisis periods, dated according to Berger and Bouwman (2013). Sample means and standard deviations are provided for the following firm characteristics: group size (measured as log of real assets), leverage, profitability, tangibility, Tobin's Q, and credit rating (S&P Long Term Issuer Credit Rating converted to a 1-22 integer scale). Differences between groups for all variables are presented as well as t-tests comparing mean firm characteristic values for three groups: BB, LB, and LL.The sample is created by combining data from DealScan, ThomsonOne Banker, and Compustat. Section 2 provides more detail about data sources, sample selection, and variable definitions.
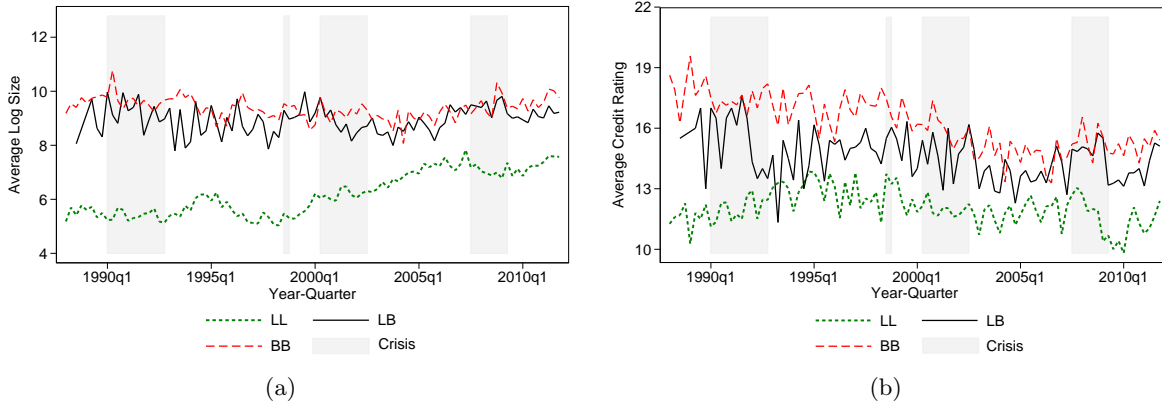
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Figure 3: Average Size and Credit Rating of Firms by Debt Choice Group[a]

The close similarity between BB and LB firms throughout the sample period is also evident in Figure 3. Figure 3(a) shows that BB and LB firms are considerably larger than LL firms. Their average log of real assets (in millions USD) range between 8 and 10. For LL firms, this figure stayed below 6 until the middle of the sample period but has since risen, although still staying smaller than other firms. The upward trend in size of BB and LB firms also began about five years later and continued through the end of the sample period. Figure 3(b) plots the evolution of average credit ratings (converted to an integer scale) for the three firm groups. The figure shows that BB firms are the highest rated, followed by LB firms, with LL firms being the lowest rated among the three groups, throughout the sample period. Moreover, overtime, ratings of BB and LB have become closer to each other.

These results reveal a systematic pattern of sorting by firms into their preferred debt instrument, based on their quality. The highest quality firms (by several measures as shown in Table 6 and Figure 3) choose to predominantly issue bonds and the lowest quality firms repeatedly obtain bank loans. Firms that switch from loans to bonds are very similar in their characteristics to predominantly bond-issuing firms. As mentioned in the introduction, on one hand bank loans are associated with greater flexibility than bonds issued in the public debt market

which cannot be renegotiated. On the other hand, the flexibility (and monitoring provided by banks) makes bank loans costlier than bonds (in normal times). As firm quality improves, bank intermediation may become less valuable so that a high quality firm is willing to pay less for bank loans than a lower quality firm, ceteris paribus. Hence, higher quality firms are more likely to issue bonds. This implies that firms that switch to bonds from predominantly issuing loans previously must be above a cutoff quality level while the average loan issuing firm remains below the threshold.

During periods of banking crises, however, as loans become more costly, the tradeoff between the flexibility/monitoring and cost of bank loans can shift, making bonds the preferred source of debt for a larger number of firms. But this does not necessarily entail a decline in the average quality level of switching firms during a crisis. This is evident from a comparison of mean characteristics of LB firms over the entire sample period (Table 6, Panel A) to those during the four crisis periods (Table 6, Panel B) – characteristics of LB firms are close, with average size, leverage, and tangibility higher in Panel A, and profitability and Tobin's Q slightly smaller. This absence of evidence of lower quality of switching firms in crises relative to normal times is also inconsistent with the possibility that firms are "forced" to switch to bonds due to the unavailability of bank loans.

Yet another piece of evidence shows that firms might not be "forced" to make the switch. Table 7 presents post-crisis debt choices and the changes in costs witnessed by firms in different groups across the four crisis periods in the sample period. Firm groupings were assigned to each firm based on its debt choice during crisis and past history for each of the four crises in the sample. The figures in Table 7 represent averages across these four crises. Column 1 shows the percentage of firms in each group whose first post-crisis debt issue was a bond.[23] We observe (in column 1) that while 70.3% of BB firms choose bonds the first time they issue debt after the end of a crisis, the corresponding proportion for LB firms is 42.4%. Compared to LL firms, only 6.4% of which issue bonds post-crisis, the switching LB firms are substantially more likely to issue bonds. Columns 2 and 3 show the percent change in cost of issue for a firm's first post-crisis issue depending on its debt type group, averaged across all firms in the group and

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[23]Note that the post-crisis period starts in the first quarter following the crisis and ends in the last quarter before the next crisis begins. For the 2007-2009 crisis, the post-crisis period ends in 2011:Q4.

Table 7: Post Crisis Debt Choice and Cost for Firms by Debt Choice Group

Firm Group During Crisis	(1) % Firms That Issued Bonds Post Crisis	(2) % Change in Cost for Firms That Issued Bonds Post Crisis	(3) % Change in Cost for Firms That Obtained Loans Post Crisis
BB	70.30	-23.77	-51.08
BL	31.43	93.93	15.62
LB	42.36	-41.63	-63.41
LL	6.37	107.21	1.27

Notes: This table shows post-crisis debt choices and cost changes for firms based on their debt issuing choice during the crisis. All figures are in percentages and are calculated over all four crises in the sample period 1988:Q1-2011:Q4, dated according to Berger and Bouwman (2013). The first post-crisis debt issue for each firm in a given crisis is identified. The type (loan/bond) and cost of this debt issue are recorded for each firm in each crisis. Column (1) shows the percentage of firms whose first post-crisis debt issue is a bond (and not a loan). Column (2) and (3) show the average percentage cost change from the debt issue during crisis to the first post-crisis issue when the post-crisis issue is a bond and loan respectively. Group BB (LL) represents firms that issued predominantly bonds (loans), by amount of issue, over the last 20 quarters and continued issuing bonds (loans) during the crisis. Group LB (BL) represents firms that issued predominantly loans (bonds) over the past 20 quarters and switched to bond (loan) issuance during the crisis. The sample is created by combining data from DealScan, ThomsonOne Banker, and Compustat. Section 2 provides more detail about data sources, sample selection, and variable definitions.

across all four crises. This result is broken down by debt type so that column 2 (3) shows the average cost of debt for the first post-crisis issue when this issue is a bond (loan). In column 2, we see that LB firms also see a large 41.6% drop in debt cost. This large drop in cost between an LB firm's crisis bond issue and first post-crisis bond issue is not purely attributable to debt cost decline as the economy recovers from the credit disruption. We infer this because BB firms, that are quite similar to LB firms, witness a smaller drop of 23.8%. Finally, note that even though loans are generally costlier in normal times, both BB and LB firms enjoy a drop in debt cost if they issue a loan post-crisis. This may, at least in part, be driven by the high credit quality of these firms relative to LL firms. Also, the larger drop (when the first post-crisis debt is a loan) seen by LB firms than BB firms may be because (a) debt cost was especially high for LB firms during crisis, reflecting an "unknown" issuer premium, and (b) they access bank loans more than BB firms, thereby establishing a longer or more recent history.

The high costs of switching incurred by LB firms compared to what they might have faced had they obtained a bank loan during crisis (see section 4), the high propensity for them to issue bonds post-crisis relative to LL firms, and the large drop in cost of issuing bonds post crisis – all suggest that switching firms are not "forced" to switch to bonds due to unavailability of bank loans during periods of bank credit disruption. Moreover, firms that switch during crises are no worse in their characteristics than those that switch in normal times. This additionally suggests that a shift in tradeoff between cost of bank loans and the benefits of bank intermediation services are also not driving the switching decision. There may be other factors underlying the decision to switch to bonds during periods of bank credit disruption. We discuss some potential mechanisms in section 8.

6 Switching Firms Suffer Small Real Consequences

In our final investigation, we consider the implications of firm debt choices during crises for their real outcomes: investment, output, and employment. To this end, we regress firm level changes in real outcomes on debt type groups in a multivariate analysis. This regression is estimated on a sample consisting of stacked cross-sections of firms, one cross-section from each of the four crises in the sample period dated according to Berger and Bouwman (2013). For a given crisis, we identify all firms that issued debt during the crisis and classify them into one of the four debt type groups: BB, BL, LB, and LL.[24] Recall that firms are assigned to the BB (LL) group if they issued bonds (loans) during the crisis period and issued predominantly bonds (loans) in the 20 quarters preceding the start of the crisis. Firms are assigned to the LB (BL) group if they switched to issuing bonds (loans) during the crisis from predominantly issuing loans (bonds) in the 20 quarters preceding the crisis. We estimate the following regression on this stacked cross-section sample:

$$\Delta P_{it} = \beta_0 + \beta_1 G_{it} + \beta_2 c_t + \beta_3 X_i^{\text{precrisis}} + \gamma_k + \epsilon_{it} \tag{6.1}$$

where ΔP_{it} denotes change in firm i's real outcomes in terms of sales (Table 8, columns 1

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[24]Our sample contains one observation per firm per crisis. In order to uniquely classify firms into one of the four debt type groups in a crisis, we restrict our attention to firms that issued solely one type of debt during the crisis, either all loans or all bonds. This reduces the sample by approximately 10%.

Table 8: Real Effects of Firm Debt Choice

	(1) Change in Sales	(2) Change in Sales	(3) Change in Average Sales	(4) Change in Average Sales	(5) Change in Investment	(6) Change in Investment	(7) Change in Average Investment	(8) Change in Average Investment	(9) Change in Employment	(10) Change in Employment
BL	-0.081	-0.137**	-0.099**	-0.130***	-0.205**	-0.373***	-0.138	-0.246***	-0.063	-0.100
	(0.054)	(0.054)	(0.047)	(0.046)	(0.099)	(0.102)	(0.087)	(0.085)	(0.075)	(0.075)
LB	-0.027	-0.094**	-0.037	-0.050	-0.101	-0.259***	-0.088	-0.129**	0.024	-0.024
	(0.045)	(0.044)	(0.037)	(0.035)	(0.079)	(0.082)	(0.066)	(0.065)	(0.066)	(0.065)
LL	-0.162***	-0.217***	-0.167***	-0.178***	-0.376***	-0.527***	-0.299***	-0.343***	-0.076	-0.117*
	(0.045)	(0.045)	(0.037)	(0.037)	(0.082)	(0.086)	(0.069)	(0.068)	(0.061)	(0.061)
Crisis: 1990:Q1-1992:Q4	0.149***		0.092***		0.310***		0.194***		0.072***	
	(0.031)		(0.027)		(0.064)		(0.057)		(0.027)	
Crisis: 1998:Q3-1998:Q4	0.146***		0.114***		0.624***		0.629***		0.126***	
	(0.042)		(0.039)		(0.091)		(0.077)		(0.045)	
Crisis: 2007:Q3-2009:Q2	-0.074***		0.038		-0.058		0.196***		-0.053*	
	(0.028)		(0.025)		(0.054)		(0.046)		(0.027)	
Length of Crisis		0.008*		-0.002		-0.014		-0.043***		0.001
		(0.004)		(0.004)		(0.010)		(0.008)		(0.004)
Size	-0.058***	-0.070***	-0.058***	-0.062***	-0.061***	-0.091***	-0.061***	-0.071***	-0.035***	-0.044***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.016)	(0.016)	(0.014)	(0.014)	(0.007)	(0.006)
Leverage	-0.008	0.014	-0.004	0.000	-0.016	0.033	-0.029	-0.014	-0.119**	-0.100**
	(0.041)	(0.039)	(0.037)	(0.036)	(0.083)	(0.081)	(0.066)	(0.064)	(0.047)	(0.046)
Profitability	-1.875***	-1.868***	-1.707***	-1.683***	2.583***	2.610***	2.738***	2.800***	1.254***	1.298***
	(0.522)	(0.533)	(0.496)	(0.499)	(0.906)	(0.950)	(0.826)	(0.856)	(0.264)	(0.265)
Tangibility	0.130	0.194**	0.177**	0.195**	-0.658***	-0.537***	-0.415***	-0.375**	0.072	0.106
	(0.089)	(0.089)	(0.079)	(0.078)	(0.169)	(0.168)	(0.150)	(0.149)	(0.066)	(0.066)
Tobin's Q	0.041***	0.039***	0.039***	0.037***	0.012	0.006	0.021	0.016	0.035***	0.033***
	(0.009)	(0.009)	(0.008)	(0.008)	(0.019)	(0.019)	(0.013)	(0.013)	(0.005)	(0.005)
Constant	-0.284	-0.233	0.037	0.121	0.117	0.553	-1.085**	-0.469	0.608***	0.687***
	(0.210)	(0.230)	(0.225)	(0.233)	(0.381)	(0.410)	(0.483)	(0.490)	(0.207)	(0.212)
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2,847	2,847	2,850	2,850	2,631	2,631	2,710	2,710	2,757	2,757
R-squared	0.154	0.138	0.149	0.144	0.100	0.076	0.111	0.099	0.094	0.085

Notes: This table presents coefficient estimates from stacked cross section regressions of changes in real outcomes over crises on firm debt choice type. The sample includes cross sections of firms issuing new debt, in the form of loans or bonds, during each of four financial crises. The crisis periods are dated following Berger and Bouwman (2013). All firms issuing a unique kind of debt during a crisis (either all loans or all bonds) are included in the stacked sample. The dependent variable in columns 1-4 (5-8) is the change in sales (investment) of a firm over a crisis. Change in sales (investment) is measured as the difference between the log of real sales (investment) of a firm in the last quarter of the crisis and the average of the four quarters prior to the crisis. Change in average sales (investment) is measured as the difference between log real sales (investment) averaged over the last four quarters of the crisis and the average of four quarters prior to the crisis. The dependent variable in columns (9) and (10) is the change in employment for a firm in a crisis period. It is measured as the difference between ln(employment) in the last year of the crisis and the year prior to the crisis. Firm debt choice type is given by classifying firms into four groups: BB, BL, LB, and LL in each crisis. Group BB (LL) represents firms that issued predominantly bonds (loans), by amount of issue, over the last 20 quarters and continued issuing bonds (loans) during the crisis. Group LB (BL) represents firms that issued predominantly loans (bonds) over the past 20 quarters and switched to bond (loan) issuance during the crisis. Firm characteristics are included as controls and are averaged over four quarters prior to the crisis. Firm size is measured as log of real assets. In columns (1),(3),(5), (7), and (9), fixed effects for each of the four crises are included; the omitted crisis is 2000:Q2-2002:Q3. In columns (2), (4), (6), (8), and (10), a variable measuring the length of the crisis is included. Industry fixed effects are included in all specifications. The sample is created by combining data from DealScan, ThomsonOne Banker, and Compustat. Section 2 provides more detail about the data sources. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

and 2), investment (Table 8, columns 5 and 6), and employment (Table 8, columns 9 and 10) between the last quarter of a crisis and the average of four quarters before the start of the crisis for each firm. In an alternative specification, instead of considering the real outcome in the last quarter of the crisis, we take its average over the last four quarters of the crisis (Table 8, columns 3-4, 7-8). In the case of the 1998 crisis, the average is taken over the two quarters of the crisis (since the crisis did not last four quarters). Investment and output (sales) are measured as natural log of millions of real U.S. dollars; employment is measured as the natural log of number of people employed in thousands. Recall that $G_{i,t}$ denotes the debt choice assignment of firm i in quarter t. BB group is the omitted category so that the coefficient β_1 reflects the difference in changes in real outcomes between a given debt choice group and the BB group. c_t is a vector of indicator variables identifying each crisis (dated according to Berger and Bouwman (2013)) distinctly. In an alternative specification, we control for the length of the crisis instead of indicators for each crisis (Table 8, columns 2, 4, 6, 8, and 10). Firm characteristics are included as averages over four quarters preceding each crisis. In all specifications, standard errors are corrected for arbitrary heteroskedasticity.

Note that while we can observe output and investment at a quarterly frequency, employment is available only annually. Thus, when the dependent variable is employment, t represents a year. All years which contain at least one quarter of financial crisis are considered crisis years. The change in employment is defined as the difference between the log of employment during the last and first years of the crisis.

Table 8 shows that relative to BB firms, the switching LB firms do not fare significantly worse in their real outcomes, despite incurring substantially higher costs of debt (as described in section 4). The coefficient estimate on LB in all specifications is negative but small and statistically insignificant in most cases. For sales and investment, the specifications controlling for the length of crisis do feature a statistically significant negative coefficient for the LB groups. However, we do not consider this evidence robust because it does not hold in all specifications, nor does it hold in our preferred specification (with crisis fixed effects). In comparison, LL firms witness much larger and significant declines in both investment and sales, relative to BB and LB firms. While sales declined about 0.16 log points more than BB firms, investment declined more (relative to BB firms), ranging from 0.18 to 0.53 log points, depending on the

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specification. The estimated decline in employment relative to the BB group is statistically indistinguishable from zero for the LL and LB groups. In magnitude, however, the coefficient estimate on LL is more negative than that of LB.

In an additional regression, we extend the set of firms to include also firms that did not issue any debt during the crisis: the "no credit" (NC) group. These are firms which issued debt in the form of either loans or bonds at least once over the sample period, but which do not issue debt during a given crisis period. This regression allows us to compare the outcomes of debt issuing firms to those that did not obtain any debt. Note, however, that NC firms can be both those that did not seek any debt and those that sought debt but were denied; we cannot distinguish between these two types of NC firms. Nonetheless, we think it is valuable to examine the changes in real outcomes experienced by this mixed group over periods of crisis. Note that the inclusion of firms that did not demand debt, in addition to those that demanded but did not receive debt, will bias our coefficient towards zero. Adding this group to our stacked cross-section sample changes the nature of the sample significantly. The NC firms make up 79.3% of the sample. These firms are slightly smaller than LL firms on average (log of assets in millions of 5.70 versus 5.97), have slightly lower tangibility ratios than LL firms (.315 vs. .320), and have higher leverage ratios compared to LL firms (.319 vs. .301). They have slightly higher values of profitability, credit rating, and Tobin's Q compared to LL firms.

Table 9 presents coefficient estimates from this model. As we expected, the estimated coefficients on the NC group show that this group experienced worse outcomes than all other firms that received some form of debt. While their sales dropped 0.23 log points more than BB firms, their investment declined more than 0.3 log points. Employment also declined in NC firms relative to BB firms, but the estimates are statistically indistinguishable from zero.

On the basis of results in Tables 8 and 9, we can conclude that debt-demanding firms' suffer smaller drops in their real outcomes relative to firms that did not receive or demand any debt. Among debt-demanding firms, LL firms suffered the most, followed by LB, which, in turn, witnessed small and similar changes in their outcomes as BB firms over the crises. None of the firm groups suffered statistically significant declines in their employment levels. The fact that even groups of firms that did not issue bonds experienced small declines in employment suggests that bond issuance by large firms cannot explain the absence of large

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Table 9: Real Effects of Firm Debt Choice

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Change in Sales	Change in Sales	Change in Average Sales	Change in Average Sales	Change in Investment	Change in Investment	Change in Average Investment	Change in Average Investment	Change in Employment	Change in Employment
BL	-0.083	-0.119**	-0.082*	-0.108**	-0.167*	-0.309***	-0.107	-0.210**	-0.038	-0.065
	(0.054)	(0.054)	(0.046)	(0.045)	(0.097)	(0.101)	(0.086)	(0.085)	(0.075)	(0.075)
LB	-0.034	-0.115***	-0.019	-0.053	-0.065	-0.264***	-0.038	-0.110*	0.030	-0.021
	(0.044)	(0.044)	(0.035)	(0.034)	(0.076)	(0.080)	(0.065)	(0.064)	(0.066)	(0.066)
LL	-0.083**	-0.118***	-0.067**	-0.081**	-0.283***	-0.391***	-0.204***	-0.240***	-0.023	-0.046
	(0.041)	(0.041)	(0.033)	(0.033)	(0.072)	(0.077)	(0.061)	(0.060)	(0.058)	(0.058)
NC	-0.139***	-0.163***	-0.127***	-0.134***	-0.303***	-0.381***	-0.256***	-0.276***	-0.072	-0.087
	(0.040)	(0.041)	(0.032)	(0.032)	(0.070)	(0.075)	(0.059)	(0.059)	(0.058)	(0.058)
Crisis: 1990:Q1-1992:Q4	0.112***		0.084***		0.321***		0.235***		0.070***	
	(0.022)		(0.019)		(0.040)		(0.035)		(0.017)	
Crisis: 1998:Q3-1998:Q4	0.074***		0.067***		0.515***		0.506***		0.083***	
	(0.018)		(0.016)		(0.034)		(0.029)		(0.016)	
Crisis: 2007:Q3-2009:Q2	-0.109***		-0.018		-0.108***		0.126***		-0.051***	
	(0.019)		(0.017)		(0.036)		(0.031)		(0.017)	
Length of Crisis		-0.002		-0.002*		-0.039***		-0.042***		-0.005***
		(0.002)		(0.001)		(0.003)		(0.003)		(0.002)
Size	-0.033***	-0.041***	-0.031***	-0.035***	-0.026***	-0.048***	-0.017**	-0.026***	-0.015***	-0.020***
	(0.006)	(0.005)	(0.005)	(0.005)	(0.008)	(0.008)	(0.007)	(0.007)	(0.003)	(0.003)
Leverage	-0.081**	-0.070*	-0.080**	-0.076**	0.000	0.040	-0.084*	-0.068	-0.141***	-0.136***
	(0.037)	(0.037)	(0.032)	(0.032)	(0.053)	(0.052)	(0.049)	(0.049)	(0.011)	(0.011)
Profitability	0.213	0.268	0.151	0.179	2.422***	2.691***	1.731***	1.814***	0.001	0.005
	(0.528)	(0.504)	(0.452)	(0.439)	(0.379)	(0.387)	(0.421)	(0.456)	(0.013)	(0.013)
Tangibility	0.013	0.083	0.040	0.073*	-0.677***	-0.524***	-0.507***	-0.441***	0.016	0.058*
	(0.052)	(0.051)	(0.043)	(0.043)	(0.089)	(0.089)	(0.078)	(0.078)	(0.035)	(0.035)
Tobin's Q	0.028***	0.027***	0.027***	0.026***	0.027***	0.024***	0.028***	0.026***	0.025***	0.024***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.005)	(0.005)	(0.006)	(0.005)	(0.002)	(0.002)
Constant	0.016	0.106	0.114	0.185*	0.159	0.792***	-0.344	0.247	0.230*	0.331***
	(0.206)	(0.205)	(0.113)	(0.112)	(0.234)	(0.246)	(0.266)	(0.267)	(0.124)	(0.125)
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	9,739	9,739	9,748	9,748	8,940	8,940	9,269	9,269	9,414	9,414
R-squared	0.074	0.060	0.068	0.063	0.086	0.058	0.084	0.072	0.050	0.043

Notes: This table presents coefficient estimates from stacked cross section regressions of changes in real outcomes over crises on firm debt choice type. The sample includes cross sections of firms issuing new debt, in the form of loans or bonds, during each of four financial crises. The crisis periods are dated following Berger and Bouwman (2013). All firms issuing a unique kind of debt during a crisis (either all loans or all bonds) are included in the stacked sample. The dependent variable in columns 1-4 (5-8) is the change in sales (investment) of a firm over a crisis. Change in sales (investment) is measured as the difference between the log of real sales (investment) averaged over the last four quarters of the crisis and the average of the four quarters prior to the crisis. Change in average sales (investment) is measured as the difference between log real sales (investment) averaged over the last four quarters of the crisis and the average of four quarters prior to the crisis. The dependent variable in columns (9) and (10) is the change in employment for a firm in a crisis period. It is measured as the difference between ln(employment) in the last year of the crisis and the year prior to the crisis. Firm debt choice type is given by classifying firms into five groups: BB, BL, LB, LL, and NC in each crisis. Group BB (LL) represents firms that issued predominantly bonds (loans), by amount of issue, over the last 20 quarters and continued issuing bonds (loans) during the crisis. Group LB (BL) represents firms that issued predominantly loans (bonds) over the past 20 quarters and switched to bond (loan) issuance during the crisis. Group NC refers to firms that did not receive any credit during the crisis. Firm characteristics are included as controls and are averaged over four quarters prior to the crisis. Firm size is measured as log of real assets. In columns (1),(3),(5), (7), and (9), fixed effects for each of the four crises are included; the omitted crisis is 2000:Q2- 2002:Q3. In columns (2), (4), (6), (8), and (10), a variable measuring the length of the crisis is included. Industry fixed effects are included in all specifications. The sample is created by combining data from DealScan, ThomsonOne Banker, and Compustat. Section 2 provides more detail about the data sources. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

negative employment effects of crises in large firms.

Does this absence of large negative real consequences for switching firms mask alternative strategies that these firms may have employed to tide over their high cost of debt? We estimate regressions of the same form as those described in equation 6.1 above, but with the dependent variables replaced by cash holdings, inventory, and R&D expenditures. These firm level variables are measured quarterly and differences over the crisis period are defined as for the real variables above. The results presented in Table 10 show that LB firms are not employing alternative strategies to maintain their levels of real outcomes relative to BB firms despite incurring higher debt costs. Switching LB firms do not reduce their cash holdings, inventories, and R&D expenditures significantly more than BB firms. Although the coefficients are negative, they are small in magnitude and statistically insignificant. A similar result holds even for cash holdings and R&D expenditures of LL firms. These firms, however, did reduce their inventories significantly more than BB firms.

We should note that the stacked cross-section sample allows us to identify systematically the associations between the business cycle, firms' debt choice types, and firms' real outcomes. It is worth noting, however, that there are differences in both group assignments and firm outcomes across the four crises. First, the LB group grows in size (as a percentage of all debt issuing firms in a crisis) over the sample period, ranging from 1.80% of firms in the 1990-1992 crisis to 18.64% of firms in the 2007-2009 crisis. Second, the 2007-2009 crisis displayed the largest increases in debt costs (for both bonds and loans) and the largest negative real effects for all firms. For example, the average firm in all four debt type groups saw decreases in sales, investment and employment during the 2007-2009 crisis (with BB experiencing the smallest decreases and LL experiencing the largest decreases). In the 2000 crisis, the average firm in all four groups experienced a drop in investment, but other real outcomes increased or remained the same. In the 1990-1992 crisis, investment dropped only for LL firms; all other groups saw an increase in investment or no change; output and employment did not drop for the average firm in any group. Finally, in the 1998 crisis, the average firm in all four groups saw increases in its real outcomes. Despite this heterogeneity in the overall size and direction of the real effects changes over the four crises, the sorting result that LB firms are statistically indistinguishable in their characteristics from BB firms and that LL firms fare worse than BB firms (experience

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Table 10: Alternative Outcomes of Firm Debt Choice

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Change in Cash Holdings	Change in Cash Holdings	Change in Average Cash Holdings	Change in Average Cash Holdings	Change in Inventory	Change in Inventory	Change in Average Inventory	Change in Average Inventory	Change in R&D Expenditure	Change in R&D Expenditure	Change in Average R&D Expenditure	Change in Average R&D Expenditure
BL	0.146	0.179	0.104	0.152	-0.075	-0.089	-0.082*	-0.091*	-0.088	-0.252*	-0.040	-0.156*
	(0.143)	(0.143)	(0.135)	(0.134)	(0.058)	(0.058)	(0.049)	(0.049)	(0.145)	(0.145)	(0.094)	(0.092)
LB	-0.006	0.002	-0.055	-0.065	-0.014	-0.022	-0.024	-0.009	-0.092	-0.192**	-0.061	-0.100
	(0.113)	(0.111)	(0.103)	(0.101)	(0.048)	(0.046)	(0.038)	(0.037)	(0.085)	(0.085)	(0.070)	(0.068)
LL	-0.077	-0.070	-0.056	-0.063	-0.137***	-0.144***	-0.141***	-0.130***	-0.060	-0.153*	-0.083	-0.127*
	(0.111)	(0.109)	(0.102)	(0.100)	(0.047)	(0.045)	(0.037)	(0.037)	(0.089)	(0.089)	(0.076)	(0.075)
Crisis: 1990:Q1-1992:Q4	-0.079		-0.149**		0.011		0.013		0.329***		0.237***	
	(0.071)		(0.063)		(0.035)		(0.031)		(0.078)		(0.060)	
Crisis: 1998:Q3-1998:Q4	-0.224**		-0.256***		0.150***		0.126***		0.210**		0.163**	
	(0.097)		(0.080)		(0.047)		(0.040)		(0.094)		(0.069)	
Crisis: 2007:Q3-2009:Q2	-0.083		-0.167***		0.035		0.090***		0.116*		0.122***	
	(0.059)		(0.052)		(0.032)		(0.027)		(0.064)		(0.046)	
Length of Crisis		0.015		0.015*		-0.013***		-0.014***		0.010		0.005
		(0.010)		(0.008)		(0.005)		(0.004)		(0.010)		(0.008)
Size	0.011	0.014	0.015	0.016	-0.053***	-0.055***	-0.048***	-0.047***	-0.052***	-0.059***	-0.037**	-0.041***
	(0.016)	(0.016)	(0.014)	(0.014)	(0.009)	(0.008)	(0.008)	(0.007)	(0.018)	(0.018)	(0.015)	(0.015)
Leverage	0.216	0.212	0.247*	0.248*	-0.122	-0.119	-0.104	-0.109*	0.122	0.114	0.059	0.045
	(0.132)	(0.132)	(0.144)	(0.148)	(0.076)	(0.075)	(0.065)	(0.065)	(0.079)	(0.081)	(0.087)	(0.087)
Profitability	3.107***	3.075***	2.680***	2.619***	1.538***	1.538***	1.224***	1.230***	2.998***	2.992***	2.357***	2.355***
	(0.717)	(0.706)	(0.649)	(0.634)	(0.590)	(0.592)	(0.534)	(0.533)	(0.644)	(0.698)	(0.528)	(0.565)
Tangibility	0.294*	0.278*	0.125	0.117	0.208**	0.219**	0.240***	0.229***	-0.211	-0.109	-0.194	-0.172
	(0.169)	(0.168)	(0.154)	(0.154)	(0.106)	(0.103)	(0.089)	(0.086)	(0.247)	(0.240)	(0.173)	(0.168)
Tobin's Q	0.024**	0.026**	0.024**	0.027***	0.055***	0.054***	0.053***	0.052***	0.045***	0.038***	0.046***	0.040***
	(0.011)	(0.011)	(0.010)	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)	(0.009)	(0.008)	(0.008)	(0.007)
Constant	-1.703*	-1.931**	-1.100	-1.358*	0.766	0.925	0.485	0.641	0.109	0.442**	-0.016	0.237
	(0.961)	(0.970)	(0.751)	(0.760)	(0.763)	(0.767)	(0.495)	(0.498)	(0.200)	(0.215)	(0.172)	(0.178)
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2,847	2,847	2,845	2,845	2,396	2,396	2,417	2,417	818	818	1,060	1,060
R-squared	0.047	0.046	0.052	0.048	0.105	0.104	0.103	0.101	0.165	0.140	0.138	0.119

Notes: This table presents coefficient estimates from stacked cross section regressions of changes in several firm level outcomes over crises on firm debt choice type. The sample includes cross sections of firms issuing new debt, in the form of loans or bonds, during each of four financial crises. The crisis periods are dated following Berger and Bowman (2013). All firms issuing a unique kind of debt during a crisis (either all loans or all bonds) are included in the stacked sample. The dependent variable in columns 1–4 is change in cash holdings. The dependent variable in columns 5–8 is the change in inventory of a firm over a crisis. The dependent variable in columns 9–12 is the change in R&D expenditures. The change in each of these variables is defined as the difference between the log of real cash holdings, inventory, or R&D expenditure of a firm in the last quarter of the crisis and the average of the four quarters prior to the crisis. The change in average values of each of these variables is as the difference between log real cash holdings, inventory, or R&D averaged over the last four quarters of the crisis and the average of the four quarters prior to the crisis. Firm debt choice type is given by classifying firms into four groups: BB, BL, LB, and LL in each crisis. Group BB (LL) represents firms that issued predominantly bonds (loans), by amount of issue, over the last 20 quarters and continued issuing bonds (loans) during the crisis. Group LB (BL) represents firms that issued predominantly loans (bonds) over the past 20 quarters and switched to bond (loan) issuance during the crisis. Firm characteristics are included as controls and are averaged over four quarters prior to the crisis. Firm size is measured as log of real assets. In columns (1),(3),(5), (7), (9) and (11), fixed effects for each of the four crises are included; the omitted crisis is 2000:Q2- 2002:Q3. In columns (2), (4), (6), (8), (10) and (12), a variable measuring the length of the crisis is included. Industry fixed effects are included in all specifications. The sample is created by combining data from DealScan, ThomsonOne Banker, and Compustat. Section 2 provides more detail about the data sources. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

a larger decrease or a smaller increase) holds systematically across the crises. Also, this heterogeneity in outcomes across crises does not provide any evidence that bond issuance is the reason that large firms experienced smaller real effects.

7   Robustness

We examine the robustness of our baseline results to several alternative empirical strategies.

Propensity Score Matching:

Comparing across firm debt groups (LL, LB, and BB), our results demonstrate that firms systematically sort into different debt instruments, such that LL firms are, on average, of the lowest quality, followed by LB, and then by BB. Thus, in all regressions we control for several firm characteristics that previous literature has shown to influence firm debt structure. However, one potential limitation of this approach is that it may not yield a common support. For instance, an LL firm may have assets that are less than those observed for any BB or LB firm. In this case, controlling for the size of firms does not make them observationally equivalent. Propensity score matching based on characteristics of firms in these three groups can provide common support. To do this, we take LB as the treatment group and either LL or BB as the control group. In one experiment, we match LB to LL firms based on their characteristics (leverage, size, profitability, tangibility, and Tobin's Q) measured before the crisis, and indicator variables for each crisis. In another experiment, LB group is matched to BB group. In both cases, matching is based on nearest neighbor matching with common support. We estimate the average treatment effect on the treated (ATT) as the difference between the average change in the real outcome (measured as end of crisis value minus the average value over four quarters before the crisis) of the treatment and control groups.

Table 11 presents results. We observe that for all real outcomes, the change experienced by the LB group over the crisis is statistically indistinguishable from that experienced by the LL (or BB) group, when the two groups are matched on their propensity to issue bonds during crisis. The ATT for change in ln(sales) is 0.046 and is statistically insignificant, with a t-statistic of 0.87. In other words, LB firms saw 0.05 log points smaller drop in ln(sales) (measured in

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Table 11: Propensity Score Matching Results

	(1)	(2)	(3)	(4)	(5)
	Treatment Group	Control Group			
	LB	LL	BB	Difference (Average Treatment Effect on the Treated)	t Statistic
Average Change in Ln(Sales)	-0.029	-0.075		0.046	0.87
	-0.028		-0.042	0.014	0.15
Average Change in Ln(Investment)	-0.122	-0.282		0.160	1.80
	-0.113		0.180	-0.293	-1.92
Average Change in Ln(Employment)	0.036	-0.030		0.066	1.80
	0.035		0.028	0.006	0.12

Notes: This table presents results from propensity score matching. The treatment group is LB firms. The control group is LL in one experiment (column 2) and BB in the other (column 3). Group BB (LL) represents firms that issued predominantly bonds (loans), by amount of issue, over the last 20 quarters and continued issuing bonds (loans) for the current issue (during crisis). Group LB represents firms that issued predominantly loans over the past 20 quarters and switched to bond issuance for the current issue (during crisis). Matching is based on nearest neighbor matching, with common support. Sales and investment are measured in millions of real US dollars (2010=1). Employment is measured in thousands of employees. Crises are dated as identified by Berger and Bouwman (2013). The sample is created by combining data from DealScan, Thomson One Banker, and Compustat. Section 2 provides more detail about data sources.

millions of real U.S. dollars) than LL firms, but the difference was statistically indistinguishable from zero. Similarly, the difference in the change in log sales experienced by LB and BB groups is also insignificant. For investment too, we see that the ATT for LB firms is insignificant for both control groups, but the p-value is only slightly more than 0.05, suggesting that LB firms fared marginally worse than similar BB firms and marginally better than similar LL firms in terms of investment. For employment changes, we see that LB and BB firms are statistically indistinguishable. The ATT for LB firms vis-a-vis LL firms is marginally insignificant at the 5% level, suggesting that LB firms did slightly better than LL firms in terms of employment.

Thus, when we consider firms within a narrow range of similar characteristics, LB, BB, and LL firms are statistically indistinguishable from each other in terms of their real outcomes. In addition to being consistent with the baseline results presented in Table 8 above, these results indicate that firms of very similar quality experience similar outcomes, regardless of whether they issue bonds or obtain bank loans during crises. Thus, for these firms, bonds and loans are close substitutes. We also infer that firm characteristics drive debt choice even during crises. Firms that switch to bonds may not have been "forced" to do so due to credit disruption in the banking sector.

Table 12: Cost Regressions – Robustness

	Dependent Variable: Debt Cost (bps)			
	(1)	(2)	(3)	(4)
	Rated Firms Only	Tight Group Definition	10 Year Window	Term Loans Only
BL	-185.852***	-147.953***	-205.455***	-160.128***
	(21.104)	(21.312)	(29.457)	(24.831)
LB	59.924***	125.255***	59.917**	67.035***
	(16.684)	(20.167)	(25.396)	(17.121)
LL	-186.724***	-127.881***	-192.584***	-119.268***
	(20.522)	(20.326)	(28.126)	(20.601)
Crisis: 1990:Q1-1992:Q4	-58.752***	-28.798***	-41.749***	-42.862***
	(9.282)	(5.817)	(9.216)	(10.459)
Crisis: 1998:Q3-1998:Q4	-65.741***	-40.982***		-65.281***
	(12.891)	(9.081)		(12.350)
Crisis: 2007:Q3-2009:Q2	41.509***	24.556***	41.765***	84.598***
	(11.533)	(7.479)	(7.190)	(13.060)
Size	-8.434*	-21.495***	-22.232***	-31.882***
	(4.975)	(2.978)	(3.093)	(4.317)
Leverage	46.622*	72.179**	121.914***	43.721**
	(23.995)	(28.394)	(29.736)	(19.321)
Profitability	-832.660***	-643.704***	-633.729***	-715.103***
	(291.062)	(90.755)	(104.653)	(131.999)
Tangibility	4.726	-15.497	-8.278	4.917
	(29.375)	(17.694)	(19.742)	(28.885)
Tobin's Q	-3.107	-7.495***	-5.974***	-11.952***
	(7.816)	(1.700)	(1.786)	(3.036)
Credit Rating	-21.351***			
	(1.986)			
Debt Maturity	-0.431***	-0.613***	-0.645***	-0.372***
	(0.105)	(0.097)	(0.118)	(0.090)
Debt Amount	-2.533	-12.046***	-6.820*	-3.123
	(4.669)	(3.150)	(3.661)	(4.539)
Constant	834.941***	620.541***	641.794***	750.503***
	(43.139)	(60.422)	(66.153)	(42.762)
Industry Fixed Effects	YES	YES	YES	YES
Observations	1,144	2,664	2,122	1,330
R-squared	0.484	0.336	0.339	0.334

Notes: This table presents coefficient estimates from a stacked cross section regression of debt terms on new issues of debt during crisis regressed on firm debt choice type. The sample includes cross sections of firms issuing new debt, in the form of loans or bonds, during each of four financial crises. The crisis periods are dated following Berger and Bouwman (2013). All firms issuing a unique kind of debt during a crisis (either all loans or all bonds) are included in the stacked sample. The dependent variable is the average cost of debt issued during the crisis for a given firm. For loan issues, cost is measured as the drawn-all-in spread, measured in basis points. For bond issues, cost is measured as the difference between the bond interest rate and the interest rate on the treasury bond of the same maturity in basis points. Firm debt choice type is given by classification of each firm into one of four groups: BB, BL, LB, and LL. Group BB (LL) represents firms that issued predominantly bonds (loans), by amount of issue, over the last 20 quarters and continued issuing bonds (loans) during the crisis. Group LB (BL) represents firms that issued predominantly loans (bonds) over the past twenty quarters and switched to bond (loan) issuance during the crisis. In column 1, only the subset of firms that have a credit rating are included in the sample. In column (2), the estimated model employs a tighter definition for inclusion in firm groups. Group BB (LL) refers to firms issuing bonds (loans) in the current quarter who issued only bonds (loans) in the previous 20 quarters. Similarly BL (LB) refers to firms issuing loans (bonds) in the current quarter who issued only bonds (loans) in the previous 20 quarters. In column 3, the original criteria for inclusion in groups is modified by lengthening the window of past loan/bond behavior to 10 years, or 40 quarters, instead of 20 quarters for all four groups. Finally, in column 4, the definition of a current loan issue is the issuance of a term loan only; credit line issues are not counted as loan issues. Firm characteristics are included as controls and are averaged over four quarters prior to the crisis. Firm size is measured as log of real assets. Fixed effects for each of the four crises are included (the omitted crisis is 2000:Q2- 2002:Q3) as are industry fixed effects. The sample is created by combining data from DealScan, ThomsonOne Banker, and Compustat. Section 2 provides more detail about the data sources. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Table 13: Real Effects of Firm Debt Choice – Robustness

	Change in Sales				Change in Investment				Change in Employment			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Rated Firms Only	Tight Group Definition	10 Year Window	Term Loans Only	Rated Firms Only	Tight Group Definition	10 Year Window	Term Loans Only	Rated Firms Only	Tight Group Definition	10 Year Window	Term Loans Only
BL	-0.089	-0.078	-0.093	-0.021	-0.225**	-0.189*	-0.118	-0.179	-0.107*	-0.108	-0.008	-0.045
	(0.059)	(0.058)	(0.070)	(0.073)	(0.110)	(0.103)	(0.116)	(0.126)	(0.061)	(0.081)	(0.080)	(0.077)
LB	-0.058	0.003	-0.060	-0.040	-0.078	-0.094	-0.037	-0.044	0.007	0.031	0.007	0.012
	(0.049)	(0.056)	(0.055)	(0.042)	(0.085)	(0.091)	(0.090)	(0.078)	(0.054)	(0.075)	(0.067)	(0.054)
LL	-0.126***	-0.167***	-0.154***	-0.097**	-0.270***	-0.401***	-0.244**	-0.254***	-0.026	-0.101	-0.058	-0.062
	(0.048)	(0.048)	(0.056)	(0.045)	(0.089)	(0.088)	(0.095)	(0.092)	(0.052)	(0.066)	(0.065)	(0.054)
Crisis: 1990:Q1-1992:Q4	0.097**	0.148***	0.151***	0.088**	0.206**	0.311***	0.616***	0.299***	-0.064*	0.070**	0.134***	-0.028
	(0.041)	(0.031)	(0.042)	(0.042)	(0.082)	(0.064)	(0.091)	(0.102)	(0.035)	(0.027)	(0.040)	(0.036)
Crisis: 1998:Q3-1998:Q4	0.074*	0.147***		0.110**	0.316***	0.674***		0.510***	-0.009	0.130***		0.065
	(0.040)	(0.045)		(0.053)	(0.106)	(0.097)		(0.113)	(0.056)	(0.048)		(0.054)
Crisis: 2007:Q3-2009:Q2	-0.103**	-0.050	-0.080***	-0.061*	-0.123*	-0.040	-0.088*	-0.060	-0.137***	-0.046	-0.059**	-0.084**
	(0.043)	(0.031)	(0.028)	(0.037)	(0.067)	(0.059)	(0.053)	(0.070)	(0.033)	(0.030)	(0.024)	(0.033)
Size	-0.061***	-0.061***	-0.045***	-0.036***	-0.055**	-0.060***	-0.042**	-0.033*	-0.023*	-0.036***	-0.022***	-0.032***
	(0.013)	(0.009)	(0.009)	(0.009)	(0.027)	(0.017)	(0.017)	(0.020)	(0.012)	(0.007)	(0.007)	(0.008)
Leverage	0.066	-0.004	0.124*	0.039	0.048	-0.017	0.079	0.017	-0.249***	-0.111**	0.022	-0.063
	(0.118)	(0.041)	(0.067)	(0.042)	(0.181)	(0.085)	(0.138)	(0.112)	(0.082)	(0.049)	(0.049)	(0.051)
Profitability	-0.888	-1.900***	-2.117***	-1.910***	4.286**	2.593***	2.458**	1.926	5.183***	1.215***	1.006***	1.064***
	(1.131)	(0.526)	(0.546)	(0.599)	(1.925)	(0.912)	(0.976)	(1.175)	(0.747)	(0.275)	(0.263)	(0.320)
Tangibility	0.059	0.161*	0.129	0.181*	-0.249	-0.666***	-0.690***	-0.781***	0.011	0.073	0.079	-0.068
	(0.100)	(0.095)	(0.112)	(0.104)	(0.166)	(0.183)	(0.185)	(0.215)	(0.090)	(0.071)	(0.070)	(0.086)
Tobin's Q	0.049**	0.041***	0.037***	0.058***	-0.022	0.012	0.008	0.025	-0.011	0.034***	0.032***	0.034***
	(0.020)	(0.009)	(0.008)	(0.012)	(0.031)	(0.019)	(0.021)	(0.028)	(0.015)	(0.005)	(0.005)	(0.006)
Credit Rating	0.010*				0.017				-0.000			
	(0.006)				(0.012)				(0.006)			
Constant	-0.293**	-0.277	-0.585***	-0.557***	-0.987***	0.130	-0.317	-0.785***	0.338	0.640***	0.230	0.408
	(0.141)	(0.215)	(0.195)	(0.178)	(0.296)	(0.385)	(0.414)	(0.240)	(0.312)	(0.214)	(0.231)	(0.278)
Industry Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,143	2,640	2,106	1,322	1,034	2,427	1,976	1,217	1,094	2,563	2,007	1,277
R-squared	0.161	0.151	0.163	0.220	0.213	0.101	0.112	0.135	0.172	0.091	0.093	0.125

Notes: This table presents results from regressions of changes in real outcomes over crises on indicators for firm groups, crises (or lengths of crisis), firm characteristics, and industry fixed effects. BB refers to firms that predominantly issued bonds in the previous twenty quarters and again in the current quarter. LB refers to firms that predominantly obtained loans in the previous twenty quarters but switched to bonds in the current. LL refers to firms that mainly obtained loans both in the current and previous twenty quarters. BL refers to firms that mainly issued bonds in the previous twenty quarters but obtained loans in the current. Sales and investment regressions are estimated on quarterly observations and employment regressions are estimated on annual observations. Change in sales (investment) is measured as the difference between real sales (investment) of a firm in the last quarter of the crisis and the average of four quarters prior to the start of the crisis. Change in employment is measured as the difference between employment in the last year of the crisis and the year prior to the start of the crisis. Crises are dated according to Berger and Bouwman (2013). Four specifications are estimated for each real outcome (sales, investment, and employment). Columns 1, 5, and 9 estimate the basic specification on a subset of firms that have a credit rating. Columns 2, 6, and 10 employ a tighter definition for inclusion in firm groups. In these specifications, BB refers to firms issuing bonds in the current quarter who issued only bonds in the previous 20 quarters, i.e. past loan amount over the past twenty quarters equals zero. Similarly BL refers to firms issuing loans in the current quarter who issued only bonds in the previous 20 quarters. LB refers to firms issuing bonds in the current quarter who issued only loans in the previous 20 quarters. LL refers to firms that issued loans in the current quarter and strictly loans in the previous 20 quarters. In columns 3, 7, and 11, the original criteria for inclusion in groups is modified by lengthening the window of past loan/bond behavior to 10 years, or 40 quarters. In these specifications, BB refers to firms that predominantly issued bonds in the previous forty quarters and again in the current quarter. LB refers to firms that predominantly obtained loans in the previous forty quarters but switched to bonds in the current. LL refers to firms that mainly obtained loans both in the current and previous forty quarters. BL refers to firms that mainly issued bonds in the previous forty quarters but obtained loans in the current. Finally, in columns 4, 8, and 12, the definition of a current loan issue is the issuance of a term loan only, credit line issues are excluded as loans. Length of crisis is measured in quarters (years in case of employment). Firm size is measured as ln(real assets). All firm characteristics are measured as average over four quarters prior to the start of the crisis. In case of employment, characteristics are measured in the year before the crisis. Sample is created by combining data from DealScan, ThomsonOne Banker, and Compustat. Sample includes publicly traded firms that issued debt, either as bonds or as bank loans, at least once during the crisis and at least once in the four quarters (or year) before the crisis. Section 2 provides more detail about the data sources. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

In addition to the PSM analysis, we also test the robustness of our regression results to changes in definitions and inclusion criteria of crucial variables. To this end, we re-estimate multivariate regressions linking cost and real effects to firm debt choice group by changing definitions and inclusion criteria in four ways. These regressions are performed on the stacked cross-section sample described in section 6 where firms are observed once in each of the four crisis periods in the sample. Table 12 presents results from regressions of cost on debt group type and Table 13 presents results from regressions of real effects changes in crisis on debt group type. Note that the specification in Table 13 is the same as that used in section 6 for our main real effects analysis. The specification in Table 12 is similar, except that the dependent variable is the cost of debt for a given firm in a given crisis. Recall that the cost of debt is the drawn-all-in spread for loans and the difference between the bond interest rate and the interest rate on the treasury bond of matching maturity. Cost is averaged over all debt issues by a firm in a given crisis; firms issuing more than one type of debt during the crisis are excluded from the analysis.

Rated Firms Only:

We first examine debt cost and firm outcomes across debt groups by restricting our sample to only rated firms. Our main results are based on a sample containing all large, public firms. Many of these firms have never accessed the bond market at any time, making it prohibitively hard to do so during crisis. One could ask a related question to ours: *of firms that can access the bond market*, which firms did and how did they fare? We investigate this question by retaining in our sample only those firms that have a credit rating, indicating that they have issued a bond at least once in the past. Results are presented in Tables 12 (cost) and 13 (real outcomes) and remain similar to the baseline results. Table 12, column 1 shows that LB firms still face the highest cost of debt during crisis, incurring 60 basis points more cost of bonds than BB firms. In comparison, LL firms' cost of obtaining loans is the lowest. As expected, we see that higher credit ratings are associated with lower debt costs. Table 13, columns 1, 5, and 9 show that LB firms do not witness significantly larger drops in their sales, investment, and employment, respectively, than BB firms, despite incurring higher debt cost. In contrast, LL firms suffer significantly more in terms of sales and investment. Thus, our results are robust to including

only rated firms in the sample.[25]

Alternative Definition of Firm Classifications:

For our baseline analysis, we classified firms into different debt groups based on their current debt choice relative to their predominant choice in the past five years. We can alternatively make the classifications stricter by classifying a firm as a previously loan (bond) firm if it *exclusively* issued loans (bonds) in the past five years. Table 12, column 2 again shows that LB firms incur the highest cost of debt. LL firms incur 128 basis points lower cost than BB firms. With stricter group definitions, results in Table 13 show similar real outcomes for all groups in crises as the baseline results – compared to BB, LB firms do not suffer significantly more in terms of sales, investment, and employment, while LL firms do (except employment).

Term Loans Only:

In our main specifications, we include both term loans and credit lines (revolvers) as valid loan issues. A potential problem with this approach is that credit lines may not be necessarily drawn down immediately, partially or in full. This creates a potential misalignment between both the time of the loan issue (if the credit line is not drawn down immediately) and the size of the loan (if the credit line is not drawn down fully). We believe this misalignment should be insignificant, especially in times of crisis, because there is ample empirical evidence that credit line drawdowns increase during and preceding financial crisis (see, for example, Ivashina and Scharfstein (2010) and Campello et al. (2010)). Nonetheless, we estimate regressions of cost and real effects on debt type group on a sample where we exclude credit lines as loan issues. It should be noted that when examining debt behavior in the past 20 quarters to classify past debt type preference, we count either a term loan or a credit line as a relevant sign of dependence on bank loans. However, when we examine the debt issues during crisis, we only consider term loans and we exclude all firms that issued credit lines. This change affects classification of firms into the LL group and the less relevant BL group and greatly reduces the sample size, as credit lines make up a substantial percentage of overall loan issues. Our main results hold

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[25]Of course, including only rated firms does change the proportion of firms in each of the four groups, increasing the relative size of the two bond issuing groups, LB and BB.

using this stricter inclusion criterion for loans. Results are presented in Table 12 (cost) and 13 (real outcomes). Table 12 column 4 shows that LB firms still face the highest cost of debt during crisis; switching firms pay 67.04 basis points more on their bond issues than the BB group. LL firms face the lowest costs, controlling for firm characteristics, incurring costs that are 119.27 basis points lower than the BB group. The results presented in Table 13 demonstrate that changing the criterion for included loan issues does not alter our results concerning the real outcomes of firms by debt choice group over the crisis. The coefficient on the LB group is insignificant in columns 4, 8, and 12 of Table 13 confirming that the real outcomes of LB firms over crisis periods are statistically indistinguishable from those of the BB firms; this result holds for the three real outcomes: output, investment, and employment. Notice also that the coefficient estimate on the LL coefficient is negative and significant (except for employment), confirming the result that LL firms fare worse in terms of real outcomes in crisis. Thus, our results are robust to the exclusion of credit lines from the analysis.

Longer History of Firm Debt Choices:

In a final test of robustness, we examine the sensitivity of our results to the length of the window used to evaluate past debt type preference to ensure that our results are not an artifact of a specific modelling decision. To this end, we reclassify firms into debt choice groups using a backwards looking window of 40 quarters, or 10 years, instead of our preferred 20 quarter window. Changing the length of the window could potentially change the assignment of firms to debt choice groups. The results presented in Table 12, column 3 again show that LB firms incur higher bond costs in crisis (59.17 basis points higher than the BB group). The LL group again incurs the lowest costs in crisis (192.84 basis points lower than BB firm bond issues) controlling for firm characteristics. The results presented in Table 13 demonstrate that changing the window length definition does not alter our results concerning the real outcomes of firms by debt type group over the crisis. The coefficient on the LB group is insignificant in columns 3, 7, and 11 of Table 13 confirming that the real outcomes of LB firms over crisis periods are statistically indistinguishable from those of the BB firms; this result holds for the three real outcomes: output, investment, and employment. Notice also that the coefficient estimate on the LL coefficient is negative and significant (except for employment), confirming

the result that LL firms fare worse in terms of real outcomes in crisis.[26] Hence, our results are robust to changing the length of the window used to identify past firm debt type preferences.

8   Conclusion

Large firms are more likely to issue bonds when bank credit supply is disrupted. An emerging message from recent literature is that access to bond markets may be a factor underlying the small declines in output, investment, and employment witnessed by large firms during the Great Recession. In this paper, we undertake the first systematic empirical investigation of the patterns and consequences of firm debt choices during the last four financial crises in the U.S. We show that in each crisis, only a small proportion of large firms switched from being previously bank dependent to issuing bonds during the crisis. These firms were of high quality, close in their characteristics to firms that are not bank dependent and predominantly issue bonds instead. It is indeed the case that firms that issued bonds (switchers as well as traditional bond issuers) during crises remained largely unaffected in their real outcomes. However, the vast majority of large firms continued their reliance on loans or did not receive any form of credit. Such firms did witness greater negative impacts on their real outcomes. Thus, bond markets, though growing in size over time, helped only a few high quality firms to avoid large drops in their output and investment during episodes of financial crises.

Further, we find that firms that switched to issuing bonds during periods of crisis incurred very high switching costs. These costs were higher than the debt costs incurred during crises by other firm groups – the traditional loan-issuing firms that issued loans during crisis and traditional bond issuers that issued bonds in crisis. The switching cost during crises were also higher than the switching costs incurred by similar firms during normal times. Why did these firm make such a costly switch? This is an important question that requires further investigation. However, we can rule out two potential mechanisms based on the evidence presented in this paper. We also suggest another plausible factor underlying this choice.

In one potential mechanism, firms may be forced to switch to bonds if they are unable to obtain bank loans or if loans become very expensive during periods of bank credit supply dis-

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[26]Note that the 1990-1992 crisis is not included in this analysis because data limitations do not allow us to adequately observe a backwards looking window of 10 years for firms from the starting point of this crisis.

ruption. Given our observation that the switching firms are high quality firms, this mechanism is unlikely for two reasons. First, the average loan-receiving firm witnessed a 17% increase in the cost of bank loans. These firms were of lower quality than those that switched to bonds, suggesting that the latter could have also potentially received loans at similar or lower costs. Second, if the relationship bank of a switching firm was severely hit by a negative shock making it unable to lend to the firm, a high quality firm would arguably find it easier to borrow from another bank, i.e., its relationship with the bank may be less sticky than that of a lower quality firm.

An additional mechanism underlying the increase in bond issuance during crisis is that the tradeoff faced by firms in their choice between loans and bonds changes during crisis. Recall that the firm's decision to issue a bond versus obtaining a bank loan is based on the tradeoff between the cost of the financial intermediation services provided by loans and the valuation placed by firms on these services. When the cost of intermediation is high enough that it outweighs the valuation of these services, firms will prefer bonds to loans. This implies that in the event of a negative bank credit supply shock, when the cost of intermediation plausibly rises, some firms that placed lower value on bank services may prefer to switch to bonds. If the threshold quality level between loan and bond-issuing firms moves substantially because of the increased intermediation costs, we should see that switching firms during periods of bank credit disruption are of lower quality, on average, than those that switch in normal times. This is not supported in the data, however, as discussed in section 5. Thus, while the loan versus bond tradeoff plausibly shifts during crisis, it is not enough of a shift to yield wide substitution between the two forms of debt.

To understand the reasons underlying firm switching behavior during crises, then, we may have to examine firms' internal costs of switching, in addition to the observed external costs faced in the debt markets. We draw on a parallel finding in the macroeconomics literature to guide the discussion of this proposed explanation. Koenders and Rogerson (2005) and Berger (2016) develop models to explain why firms use periods of recession to reorganize their production technology to become more efficient. During periods of expansion, firms find it costly to reorganize their production processes as it requires shifting scarce factors from production to reorganization. However, this cost falls during recessions when firms operate at a smaller scale.

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The efficiency gains from reorganization may outweigh the cost of reallocation, incentivizing firms to restructure during recessions. A similar mechanism may explain why some firms switch from loans to bonds even though it is costly to do so in terms of interest rates. Firms' internal costs associated with reallocating scarce resources to reorganize their debt structure may be lower during crises, and be outweighed by the gains (over time) of switching to bonds. In future work, we plan to explore this mechanism further.

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