NBER WORKING PAPER SERIES

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Working Paper 26799
http://www.nber.org/papers/w26799

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
February 2020, Revised December 2020

The authors thank Dave Brown, Mark Flannery, Chris James, Gregor Matvos and Michael Schwert and seminar participants at the Kellogg School of Management and SMU Cox for very helpful comments and discussions. Sanhitha Jugulum and Manvendra Tiwari provided outstanding research assistance. Rajan thanks the Fama Miller Center, IGM, and the Stigler Center at the University of Chicago Booth School for research support. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 26799
February 2020, Revised December 2020
JEL No. E44,E51,G21,G23,G33

ABSTRACT

We show that after accounting for selection, credit spreads for secured debt issuances are lower than for unsecured debt issuances, especially when a firm's credit quality deteriorates, the economy slows, or average credit spreads widen. Yet firms tend to be reluctant to issue secured debt when other forms of financing are available, as we demonstrate with an analysis of security issuance over time and in particular around the COVID-19 pandemic shock in the United States in early 2020. We find that for firms that are rated non-investment grade and that have few alternative sources of financing in difficult times, the likelihood of secured debt issuance is positively correlated with the spread between traded unsecured and secured bonds. It is not correlated for firms that are investment grade. This pattern of issue behavior is consistent with theories that see collateral as a form of insurance, to be used only in extremis.

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A vast theoretical and empirical literature in corporate finance and law focuses on the role that collateral plays in corporate lending.[1] Creditors require firms with higher credit risk to secure their borrowing with collateral (see, for example, Bradley and Roberts (2015), and Rauh and Sufi (2010)). In this paper, we attempt to understand secured debt issuance better. By how much do borrowers lower their cost of debt financing if they use secured debt? Under what circumstances is security especially valued? Do we see greater security issuance under those circumstances? By whom?

At one level, it is clear why security plays such a central role in credit markets: it consists of hard assets that are not subject to asymmetric valuations in markets and that the borrower cannot alter easily. Collateral gives comfort to a lender that even if the lender does little to monitor the borrower's activity and the borrower's cash flows prove inadequate to service the debt, the lender's claim is protected by underlying value. In particular, the creditor's ability to seize and sell collateral when a borrower defaults on a promised payment allows the lender to realize repayment, at least in part. And at the corporate level, all else being equal, firms that pledge more liquid collateral find it easier not only to obtain credit but to obtain it at a reduced interest rate (Benmelech and Bergman (2009)).

Benmelech, Kumar, and Rajan (2020) show that while the issuance of collateralized debt by modern US corporations has fallen over the twentieth century, the cyclicality of secured debt issuance continues despite this trend decline. Firms tend to issue more secured debt when their credit quality is low or at times when economic growth is slower.[2] These are times when firm cash flows may fall, creditors may fear greater stockholder-debtholder conflicts (as in Jensen and Meckling (1976), Myers (1984), and Smith and Warner (1979)), and creditors may fear conflicts with other creditors over priority if the firm cannot repay them all. Under these circumstances, borrowers may need to collateralize debt issuances in order to regain access to funding (see Stulz and Johnson (1985)). Moreover, with new lenders unwilling to lend without the comfort of collateral, existing lenders might rush to secure their claims so as not to be diluted (Donaldson, Gromb, and Piacentino (2019), and Rauh and Sufi (2010)).

[1] Aghion and Bolton (1992), Bolton and Scharfstein (1996), Boot, Thakor, and Udell (1991), Hart and Moore (1994, 1998), Hart (1995), Jackson and Kronman (1979), Stulz and Johnson (1985), and Williamson (1985).

[2] For prior evidence that firms issue collateral when distressed, see, for example, Badoer, Dudley, and James (2020) Colla, Ippolito, and Li (2013), Nini, Smith, and Sufi (2012), and Rauh and Sufi (2010).

However, this leads then to the opposite question to the one we just asked. If collateral is so effective in establishing priority and diminishing inter-creditor conflicts, why don't firms issue secured debt all the time? To understand when, by whom, and why secured debt is issued, we need to delve deeper. We start by determining how security is priced in debt contracts.

Specifically, if collateral matters to creditors for the enforcement of debt claims, we should see it reflected in the pricing of secured claims vis-à-vis unsecured claims. However, finding direct empirical evidence in support of this notion has proven to be challenging. The difficulty in identifying the effects of security on debt pricing derives from the circumstances under which it is offered. Since riskier firms will offer security at riskier times, a comparison across firms of rates offered by secured debt issuances versus rates offered by unsecured debt issuances, or by the same firm over time, will tend to find higher rates for secured debt issuances (Berger and Udell (1990, 1995), John, Lynch, and Puri (2003)).[3] While the authors recognize the selection problem inherent in these findings, correcting for it has proven more difficult.

In this paper, we use three different data sets and variations of the same identification strategy to get at the true pricing of secured debt, stripped as best as possible of the selection problem (that creditors will demand collateral from riskier borrowers, especially during times in which they become even riskier). For ceteris to remain paribus, our identification strategy compares spreads on secured and unsecured credit issued by the *same firm* and at the *same point in time*.

The first data set we use is the Thompson Reuters DealScan database, which contains detailed information about bank loans made to U.S. corporations. Multiple loan facilities are often part of a single deal (or package) governed by a master loan agreement, and some of these facilities may be secured while others are unsecured. We examine the spread difference between secured and unsecured debt within the same package to get a sense of the spread associated with security alone.

[3] Strahan (1999) shows that non-price terms of loans are systematically related to pricing; secured loans carry higher interest rates than unsecured loans, even after controlling for publicly available measures of risk, suggesting that there is an important selection problem. Benmelech and Bergman (2009) overcome the problem of selection in secured debt yields by analyzing the intensive, rather than the extensive, margin of collateral, using underlying collateral liquidity to estimate its effect on the cost of debt. Booth and Booth (2006) use a two-step procedure to account for selection and find that secured bonds have predicted spreads substantially lower than if they had been made on an unsecured basis.

Second, we use the Mergent Fixed Income Securities Database (FISD), containing over 140,000 bond issuances, to examine the difference in spreads between secured and unsecured bonds issued by the same firm in the same year. Finally, starting in 2002, the Trade Reporting and Compliance Engine (TRACE) database reports dates, implied yields, and prices at which bonds trade. We examine the differences in implied spreads between a firm's secured and unsecured bonds, as reflected in secondary market trades, at a point in time. This methodology allows us some relief from the requirement that both kinds of debt should be issued by the firm close together, which enables us to measure the effect of collateral using a larger sample of bonds.

We conclude from regressions using all these different datasets that the selection bias is important, and correcting for it suggests that security is valuable to creditors – the spread difference between unsecured bonds and secured bonds issued by the same firm, also termed the *secured spread*, is positive. More specifically, across firms, we find that investors do not value the securing of a bond with collateral as much when the firm is large, has low leverage, and a substantial portion of its assets are tangible. Intuitively, if security protects a lender's claim in bankruptcy, the lender will not give up much interest rate spread for it if she is confident bankruptcy is a low probability event or she will come out whole anyway because asset values will not get eroded. Relatedly, we find that for highly rated firms, creditors pay little for the added protection afforded by security, whereas for low-rated firms, they pay a lot. Yields on bonds issued by investment grade firms (those with an S&P rating of BBB− or better) are roughly 2 basis points lower when secured, whereas this yield differential (unsecured less secured) jumps to 55 basis points for a firm having a non-investment grade rating. Similarly, implied yields from bond trades in the secondary market suggest that investors are willing to give up almost 129 basis points in spread for the added protection of security for non-investment grade issuers, whereas they reduce spreads by insignificant amounts for the added protection of security in the case of investment grade issuers.

Equally important, as a firm's credit quality deteriorates, we see spreads on secured claims improve relative to unsecured claims, suggesting that security becomes more valuable. Examining credit rating transitions for a given firm, we find that a transition from a broad rating category of A to a broad rating category of BBB does not economically or statistically change the yield differential between an unsecured and a secured bond (holding firm and other bond characteristics fixed). However, a transition from BBB to BB, from BB to B, and from B to CCC increases the credit spread between unsecured and secured bond by an *additional* 92 basis points, 21 basis points, and 131 basis points respectively, highlighting the contingent importance of security.

We also find that secured bond issuance by non-investment grade firms increases as the economy's health – as reflected in GDP growth -- or credit market health – as reflected in the Baa–Aaa spread – deteriorates. A one standard deviation increase (reduction) in Baa–Aaa spread (GDP growth) increases the probability of issuance of secured bond by non-investment grade firms by an additional 5.2 (5.3) percentage points. So creditors seem to value security more when offered by higher credit risk firms in situations of systemic economic or financial stress. For investment grade firms, however, we do not find any increase in secured bond issuance when economic or financial conditions deteriorate.

What might explain the timing of secured debt issuances? From the firm's perspective, a key factor governing issuance is whether security is priced adequately or not (see, for example, Myers and Majluf (1984)). We estimate the secured spreads for firms and compare them with the estimated and perfect foresight probabilities of their default. If anything, we find that secured spreads for highly rated firms, though small, overcompensate for the expected probability of default. Secured spreads for moderately and low rated firms are much more likely to be within a plausible range indicating fair pricing. This then deepens the puzzle. Why do highly rated firms not issue secured debt, since the marginal issuer would benefit from the decline in debt costs?

The interesting possible answer comes from examining corporate and market responses to the unexpected pandemic shock, which hit US firms and financial markets in March 2020. Prior to the massive US Federal Reserve intervention on March 23, 2020, all manner of risk spreads blew out. Investment grade firms, however, issued enormous amounts of unsecured bonds in March, April, and May, even though unsecured bond spreads had increased substantially. They issued a relatively small portion of secured bond. In contrast, non-investment grade firms issued very little unsecured bonds in March, and substantial amounts of secured bonds in April, May, and June (with the fraction of secured bonds issued decreasing as credit conditions eased over time after the Fed intervention). Interestingly, for investment grade bonds, the secured spread did not move much over this episode, while it increased significantly in magnitude for non-investment grade firms during the period of extreme stress, and then declined slowly.

The natural conclusion from all this is that unsecured bond markets shut down for non-investment grade firms as the pandemic hit, so they had to resort to secured bond issuances in order to obtain any funding at all. The ability to access such funding in times of stress was a lifeline, which enabled them to make high value-added investments -- such as avoiding costly bankruptcy. If available collateral is a form of lifeline in bad times for stressed firms, it would suggest why investment grade firms prefer to keep collateral unimpaired by issuing unsecured debt so long as they have access. In other words, untapped collateral is financial slack.[4] Unlike Myers and Majluf (1984), however, firms will preserve collateral as insurance against extreme outcomes (as in Rampini and Vishwanathan (2010, 2013)) rather than use it in the normal course to reduce adverse-selection costs (also see Acharya, Almeida, and Campello (2007), Bjerre (1999), Li, Whited, and Wu (2016), Mello and Ruckes (2017), and Schwarcz (1997) for related ideas).

All this suggests that for non-investment grade firms, variations in the secured spread reflect both the relative interest costs of secured debt issuance vis a vis unsecured debt issuance, as well as in the extreme, a lack of access to the unsecured debt market. When the secured spread increases in magnitude, therefore, it should predict secured debt issuance by non-investment grade firms, despite the inclusion of other measures of tightness in credit markets such as the Baa-Aaa spread. On the other hand, it should have little power to predict secured debt issuance by investment grade firms. The empirical evidence is consistent with these implications.

We are obviously not the first to note that collateral is more important in distressed situations. A large literature explores the use of covenants in debt contracts and how they vary with the state of the firm and the cycle (see, e.g., Begley (1994), Bradley and Roberts (2015), and Malitz (1986)). In particular, Bradley and Roberts (2015) use DealScan data to examine the timing and pricing of covenants, including security. Although their method of correcting for selection is different, they find as we do that covenants are priced by lenders and are more likely to be used in business cycle troughs. Our contribution is to focus on collateral, to use a more direct method of correcting for selection bias, to show that collateral is also priced in public debt issuances, and finally to offer an explanation for the reluctance of highly rated firms to issue secured debt.

Our paper's methodology to deal with selection is closely related to Luck and Santos (2020), who use a comprehensive sample of loans by large banks to get at the pricing of collateral. Although our conclusion that collateral is priced for riskier firms is similar to theirs, we also offer

[4] Of course, any cost to the borrower of issuing collateralized debt – including the transactions costs of perfecting collateral – could explain why the small pricing benefit to investment grade issuers is swamped. However, staying unsecured could also entail transactions costs, such as the costs of monitoring negative pledge clauses. This is why we appeal to more significant costs and benefits to explain the differences in issuance.

an explanation for the pattern of issuance of secured debt across firms and over time. Similarly, Schwert (2020) investigates the pricing of bank loans relative to bonds using a similar approach with bonds and loans matched at the firm-level. The focus of our papers is, however, very different.

The paper is organized as follows. Section I outlines our identification strategy and describes the data sets used. Section II discusses baseline estimates of the effects of secured debt on credit spreads. Section III analyzes how the secured credit spread varies with a firm's characteristics. Section IV examines the behavior of issuance and spread over the business cycle. In Section V we examine spreads and issuance during the early days of the Covid pandemic, and draw on theory to explain corporate issuance behavior. We then relate the issuance of secured debt more systematically to credit spreads. We conclude in Section VI.

I. Data and Empirical Strategy

Let us start by describing the identification strategy for measuring the secured spread, and show that with the appropriate identification strategy, it is indeed positive.

A. Identification Strategy

The difficulty in identifying the effects of security on debt pricing derives from the circumstances under which it is offered. The selection effect, in which riskier firms will offer security at riskier times, makes it difficult to analyze the impact of security on credit spreads. Indeed, in a comparison of rates offered by secured debt issuances against rates offered by unsecured debt issuances across firms, a number of studies have found a positive relation between security and credit spreads despite attempting to control for issuer quality.

Given that creditors will demand collateral from risky borrowers, and more so during downturns when they become even riskier, our identification strategy attempts to compare spreads on secured and unsecured credit of the *same firm* and at the *same point in time*. We facilitate this strategy by including three time-varying firm effects depending on the dataset: firm × year, firm × year × quarter, and firm × year × month fixed effects. To ensure that our results are not driven by other characteristics that might vary systematically between secured and unsecured debt, we control for such debt characteristics as seniority, maturity, loan amount, presence of covenants, and callability. We estimate the following regression specification:

$$spread_{i,j,t} = \beta * secured_{i,j,t} + \theta X_{i,j,t} + \delta_{j,t} + \varepsilon_{i,j,t}, \quad (1)$$

where $spread_{i,j,t}$ is the spread for debt *i* of firm *j* at time *t*. The variable $secured_{i,j,t}$ is a dummy that equals one if debt *i* is secured, and zero otherwise. The variable $X_{i,j,t}$ controls for debt characteristics, while $\delta_{j,t}$ represents firm × time fixed effects. We use three main data sets to estimate regression (1): DealScan, Mergent, and TRACE. We draw on supplementary sources to complement our analysis.

B. DealScan Loan Data

We obtain information on corporate loans from the Thompson Reuters DealScan database, which contains detailed information about bank loans made to U.S. and foreign corporations, with coverage starting in the mid-1980s. Because DealScan coverage is limited and information on contract characteristics is sporadic before 1994, we restrict our analysis to the 1994 to 2018 time period.[5] The basic unit of observation in DealScan is a loan facility. Multiple loan facilities are often part of a single deal (or package).[6] The data contain information on the different attributes of a loan facility, such as the amount, promised yield, maturity, security, and seniority. What is important here is that the same loan deal may contain both a secured facility and an unsecured facility.

We apply three filters to the DealScan data. First, we restrict our analysis to dollar-denominated loans granted to nonfinancial U.S. firms.[7] Second, since we focus on measuring the cost of secured debt, we require the all-in-drawn spread and secured status for loans to be available. Finally, given that our identification strategy for the DealScan data relies on within-package variation, we exclude loan facilities originated more than a month after the first facility in a package is originated.[8] Our final data set contains 50,614 facilities from 32,420 loan packages. Panel A of Table I provides summary statistics on key variables from DealScan used in our analysis. Spread is measured as the promised yield minus the maturity-matched LIBOR at issuance. The mean (median) spread in our sample is 285 (255) basis points. About 85% of facilities are secured, and the mean (median) maturity of a loan facility is 3.9 (4.1) years. A

[5] Chava and Roberts (2008) also restrict their analysis to the time period beginning 1994.
[6] According to Sufi (2007): "… the actual syndicated loan contract is drafted at the deal level, and covenants and all lenders are listed together on this contract, even if a lender loans only on one tranche. While the maturity and pricing of the loan tranches can vary within a syndicated loan deal, there is one contract, and all lenders are chosen on the tranches collectively, not independently".
[7] We drop financial firms (SIC codes 6000–6999) and government agencies (SIC codes 9000–9999).
[8] This ensures that issuing firm's fundamentals do not change between the issuance of multiple facilities. The results are not sensitive to this restriction as only a small percentage of facilities are originated with significant delay.

negligible number of facilities (55 of 50,614) are subordinated or junior loans. Covenant is a dummy that equals one if the loan contract contains one or more financial covenants, and zero otherwise. One or more financial covenants were contained in 53% of loan facilities.

C. Mergent Bond Data

We obtain information on bond issuances from the Mergent Fixed Income Securities Database – a comprehensive database of publicly offered U.S. bonds. The FISD contains detailed information on more than 140,000 bonds. Although the Mergent data set also includes bonds issued before the 1960s, its more comprehensive coverage starts around 1960.[9] Mergent uses seven broad categories to classify the security level of bonds: (i) junior, (ii) junior subordinate, (iii) senior, (iv) senior subordinate, (v) subordinate, (vi) senior secured, and (vii) none. We classify bonds as secured if Mergent assigns them to the senior secured category. We supplement Mergent's classification of secured bonds with a textual analysis of bond names, searching for the following strings: "EQUIP," "MTG," "BACKED," "COLL," and "1st."

We omit bonds issued by financial firms and government agencies. We drop convertible bonds and bonds with floating rates. We further require the offer-yield at issuance and the bond maturity to be available. Spread is calculated as the yield spread at issuance over the maturity-matched treasury (see Gurkaynak, Sack and Wright (2007)). We drop bonds with maturity greater than 30 years because we cannot match them with similar-maturity treasury securities. This results in a sample of 30,041 individual bond offerings from 1980 to 2018. Panel B of Table I provides summary statistics on key variables from Mergent used in our analysis. The mean (median) spread in our sample is 208 (124) basis points. About 15% of bonds are secured, and the mean (median) maturity of a bond is 11 (10) years. A bond is classified as senior if Mergent assigns it to the senior or senior secured categories. Of the bonds, 91% are senior (including all the secured bonds), 67% are callable, and 40% have one or more covenants protecting bondholder interest.

We have issuer rating information for 22,541 bond issues. Non-IG is a dummy that takes the value of one if the issuing firm had a non-investment-grade rating (BB+ or worse) from S&P at the time of bond issuance. At the time of issuance, 24% had a non-investment-grade issuer rating.

[9] See Benmelech, Kumar and Rajan (2020).

D. TRACE Data

We supplement the issuance data with information on secondary bond trades from the TRACE database.[10] TRACE reports dates, implied yields, and prices at which bonds trade. We follow Bessembinder, Kahle, Maxwell, and Xu (2009) and Dick-Nielsen (2009) in cleaning the data. In particular, we exclude trades that are canceled or corrected, and we discard all but one transaction when multiple similar trades occur very closely in time. For a given bond, we calculate trade-volume weighted implied yield at the daily frequency using all transactions for the bond taking place each day. We augment the data with information on bond characteristics (security, seniority, and so on) from Mergent. Our cleaned and merged TRACE data set contains 3,675,393 observations at the bond-date level.

Panel C of Table I provides summary statistics on key variables from TRACE used in our analysis. Spread is calculated as the difference between implied yield from secondary trade prices and the yield on maturity-matched treasury. The mean (median) spread in our sample is 212 (142) basis points. Around 8% of observations are for secured bonds, and the mean (median) remaining maturity of a bond at the time of trade is 8.9 (6) years. A bond is classified as senior if Mergent assigns it to either the senior or senior secured categories. Senior bonds comprise 99% of observations, while 93% of observations are for bonds that are callable and 90% are of bonds that have one or more covenants protecting bondholder interest. Non-IG is a dummy that takes the value of one if the issuing firm had a non-investment-grade rating (BB+ or worse) from S&P at the time of the secondary trade. We have issuer rating information for 2,777,603 observations. Of these, 21% are for bonds that had a non-investment-grade issuer rating. We augment trade data with information on firm characteristics from Compustat. Size is measured as the logarithm of the total value of assets in millions of dollars, Age is number of years since the firm's first entry in Compustat, ROA is calculated as operating income scaled by total assets, Leverage is total debt scaled by total assets, and Tangibility is net plant, property and equipment scaled by total assets.

II. Secured Debt Spread

We analyze the three data sets in turn: (i) DealScan, to estimate the effect of security on credit spreads of bank loans; (ii) Mergent, to examine the credit spreads of secured corporate

[10] Trade Reporting and Compliance Engine was introduced by FINRA in July 2002. All broker-dealers who are FINRA member firms have an obligation to report transactions in corporate bonds to TRACE under an SEC-approved set of rules.

bonds at the time of issuance; and (iii) TRACE, to study the effect of security on credit spreads in the secondary bond market.

A. DealScan Bank Loans

We begin our analysis by demonstrating the difficulty in empirically estimating the effect of security on credit spreads. Figure 1 displays the median spread over LIBOR at origination for secured and unsecured loans by year of origination.[11] As Figure 1 demonstrates, the credit spread of secured loans are between 150 and 200 basis points *higher* than those of unsecured loans, with the secured-unsecured spread increasing during the Great Recession. As we have just argued, the observed higher credit spread of secured debt is driven by selection across and within firms, which we address next in our empirical analysis.

In column (1) of Table II, we report the results from estimating Regression (1) using the DealScan loan data. The regression includes year × month fixed effects to control for time-varying effects, and facility-type fixed effects to control for differences across loan facility types.[12] Starting with the main variable of interest, the coefficient on *Secured* suggests that the credit spread on secured loans is higher by 100 basis points compared to an unsecured loan. The positive coefficient on the secured dummy illustrates the selection problem of secured debt: creditors will demand collateral precisely from those borrowers who are riskier (Benmelech and Bergman (2009) and Strahan (1999)). The addition of firm fixed effects in column (2) does reduce the coefficient from 100.8 to 57.9, suggesting that some of the selection problem is indeed cross-sectional in nature and driven potentially by differences in risk across firms. However, though the coefficient on *Secured* is smaller when firm fixed effects are added to the regression, it is still positive and statistically significant, suggesting that there is also within-firm selection in the timing of secured debt issuance. Indeed, borrowers are likely to be more inclined to issue collateralized debt, or equivalently, lenders are more likely to demand collateral, when the borrower is experiencing difficult circumstances such as financial distress.

[11] In addition to the all-in-drawn-spread used in this paper to measure cost of borrowing, bank loan contracts can contain one or more fees. Berg, Saunders, and Steffen (2016) argue that fees are compensation to lenders for providing valuable drawdown options to borrowers, which are typically exercised when firm quality deteriorates. Banks should arguably demand a larger fee for this option when a firm draws down on an unsecured basis. Consequently, ours is a conservative estimate of the pricing benefit of offering security.

[12] Dealscan broadly groups facilities into credit lines, bank term loans, institutional term loans, and others.

We address the joint selection problem – that the firms that issue collateralized debt are possibly riskier and that they also issue collateral under adverse financial circumstances – by estimating the differential effect of security on loan spread after including firm × year fixed effects. The inclusion of firm × year in addition to year × month fixed effects enables us to compare loan facilities issued by the *same* firm *within* a year, correcting for overall conditions in the month of issuance. In total, there are 938 observations where the same firm obtained at least one secured and one unsecured loan facility in the same year. Indeed, as column (3) of Table II shows, once we include firm × year fixed effects, the coefficient on *Secured* is negative and statistically significant. The point estimate suggests that the credit spread on secured loans is, on average, 40.6 basis points lower than that on unsecured loans controlling for loan characteristics.

In column (4) we estimate our most exhaustive specification that includes package fixed effects. Here, we essentially compare spreads on secured and unsecured loan facilities that are part of the same loan deal. In total, there are 285 observations where the same loan package contains at least one secured and one unsecured loan facility. Since the price of all facilities of the loan are negotiated and finalized at almost same time, we ensure that spread difference across facilities is not driven by changing firm quality.[13] Similar to the results in column (3), the coefficient on *Secured* is negative and statistically significant. The point estimate on the secured dummy suggests that the spread on a secured loan is 72 basis points lower compared to unsecured loans within the same credit facility. The fact that the secured spread is larger (in absolute value) in this specification compared to column (3) suggests that even within a firm-year, there is selection in the timing of secured debt issuance.

Turning to the other explanatory variables in column (4), the coefficient on *Senior* suggests that the credit spread on senior loans is lower by 150 basis points compared to the spread on (the very few) junior or subordinated loans. Note that for a senior secured loan, both *Secured* and *Senior* dummies equal one, implying that the spread on a senior secured loan is 222 basis points lower than that on a junior unsecured loan. The coefficient on *Maturity* suggests that a one standard deviation increase in a loan facility's maturity increases the spread by 19 basis points. Notice that the sign on this coefficient is negative in columns (1) and (2), which is probably also due to

[13] We require all facilities of a package to have been originated within a one-month time period. If we do not impose this restriction, there would be 301 observations (as against 285) where the same loan package contains at least one secured and one unsecured loan facility.

selection, as better borrowers are likely to be able to borrow for longer maturities, while a deterioration in borrower health is likely to shorten maturities (Helwege and Turner (1999)). Consistent with this intuition, the sign of this coefficient changes from negative to positive once we control for time-varying firm characteristics in columns (3) and (4), which is consistent with lenders perceiving greater risk in lending for a longer term to a borrower. Finally, the coefficient on *Amount* suggests that doubling the loan amount is associated with a 7 basis point lower spread.

B. Mergent Bond Issuance

Next, we estimate the secured credit spread of corporate bonds at origination. Unlike bank loans, which are an important source of credit for younger firms, corporate bonds are typically issued by more established firms with a longer credit history (Diamond (1991)). Kashyap, Stein, and Wilcox (1993) and Becker and Ivashina (2014) show that firms that have access to both bank loans and public debt markets switch from loans to bonds when there is a contraction in bank-credit supply. Hence, our examination of secured credit spread in the corporate bond market should complement our analysis of secured credit spread in bank loans. Moreover, the Mergent sample goes back to 1980, compared to the DealScan sample, which begins in 1994. It thus enables us to study the evolution of secured credit spreads over a longer time-series.

In Figure 2, we plot the median spread at issuance of bonds over maturity-matched treasury from 1980 to 2018. As Figure 2 demonstrates, and similar to what we document in Figure 1 for syndicated loans, the credit spread of secured bonds is, on average, 35 basis points higher than that of unsecured bonds. The secured-unsecured difference widens during times of economic contraction, such as during the NBER defined recessions of 1981 to 1982 (80 basis points), 2001 (57 basis points), and the Great Recession of 2008 to 2009 (136 basis points). We now turn to empirically analyze the secured debt spread in the bond market.

We estimate regressions based on Equation (1) using the bond maturity-matched credit spread as a dependent variable and report the results in Table III. There are 30,041 individual bond offerings from 1980 to 2018 in our final sample. The regression in column (1) includes year × month fixed effects to control for time-varying effects, as well as bond characteristics such as seniority, maturity, callability, the amount issued, and whether covenants are attached to the bond.

Similar to column (1) of Table II, the coefficient on *Secured* in column (1) of Table III is positive and statistically significant suggesting that the credit spread on secured bonds is higher by 60 basis points compared to an unsecured loan. Again, as in Table II, adding firm fixed effects slightly reduces the coefficient, but the positive and significant coefficient still remains (column (2)). As before, our identification strategy hinges on the inclusion of firm × year fixed effects, which enables us to compare secured and unsecured bonds issued by the *same* firm *within* a year. Column (3) of Table III confirms our empirical strategy: once we include firm × year fixed effects, the point estimate on *Secured* suggests that the credit spread on secured bonds is, on average, 35.2 basis points lower than that on unsecured bonds. This is similar in magnitude to the 40.6 basis points spread we found for DealScan loans (column (3) of Table II).

While there are more than 30,000 individual bond offerings in the data, we achieve identification from a much smaller subset of the sample: the 706 observations in which the same firm issued at least one secured and one unsecured bond in the same year. In robustness tests reported in Appendix Table A.I we use an even tighter set of firm × year × quarter (instead of firm × year) fixed effects and find that the credit spread of secured bonds is 48.6 basis points lower than unsecured bonds. However, the number of observations with both secured and unsecured bonds issued by the same firm within the same year-quarter declines to 284.

The coefficient on *Senior* in column (1) suggests that the credit spread on senior bonds is lower by 104 basis points compared to the spread on junior bonds. Once again, there seems to be selection in this estimate. Higher credit-quality firms issue senior unsecured bonds, so when we include firm fixed effects in column (2), the magnitude of the *Senior* coefficient estimate falls to almost a third of its earlier estimated magnitude. The addition of firm × year fixed effects does not change this, suggesting that while higher credit-quality firms issue senior unsecured bonds, this issuance, on average, is not strongly correlated with changes in firm quality over time. Later, we will argue that the picture is different when we focus only on non-investment grade firms.

The coefficient on *Maturity* in column (1) suggests that a one standard deviation increase in a bond's maturity is associated with a 34 basis points lower spread. However, the sign as well as the magnitude of this coefficient changes once we control for time-varying firm characteristics in column (3), once again suggesting that firms have to pay for pushing out the maturity of their debt and thus obtaining insurance against illiquidity. The coefficient on *Maturity* in column (3) implies that a one standard deviation increase in a bond's maturity is associated with a 16 basis points higher spread. The magnitude of the coefficient is much smaller than in Table II, column (4). The coefficient on *Callable* in column (1) suggests that callable bonds have spreads that are 79 basis points higher than non-callable bonds, but there is selection again here. In column (3), the coefficient is small and statistically indistinguishable from zero. Similarly, with the presence of covenants in the bond contract, the coefficient in column (3) is small and statistically indistinguishable from zero. Finally, the coefficient on *Amount* is statistically not different from zero in column (1), but the coefficient in column (3) is positive and suggests that doubling the issuance amount is associated with a 1.6 basis points increase in spread.

The difference in coefficient estimates on maturity and covenants between Tables II and III is interesting. For bank debt (Table II), longer-maturity loans imply significantly less lender control (the average maturity is 3.91 years, so an additional year is a significant extension) and perhaps therefore require higher spreads. For bonds (Table III), maturities are long anyway, and as suggested by Diamond (1991), little control is exercised by bondholders. So the cost of an additional year of maturity in spread terms is small. A similar narrative is suggested by covenants. Banks value covenants because of the control they exert, and there is a significant spread reduction associated with them in Table II, column (3), while bondholders do not, and there is an insignificant spread reduction associated with them in Table III, column (3).

C. TRACE Secondary Market Bond Trades

We supplement our results for loan originations and bond issuances with an analysis of trades of corporate bonds in the secondary market. Secondary market trades in corporate bonds allow us to examine a broader sample of bonds while still identifying from within-firm-within-time variation.

Although the median firm in the Mergent bond issuance sample issues only one bond in a given year (and hence gets dropped in the firm × year fixed effects specification), the median firm had 67 bond observations in TRACE in a given year, providing secondary market prices for bonds issued by the firm in the past. Essentially, as long as a firm has at least one secured bond and one unsecured bond outstanding, the availability of secondary market prices allows us to examine the effect of security on spreads using bond trades of the same firm at the same point in time. Given the richness of the TRACE data, we can further restrict a comparison of secured versus unsecured bonds to same firm × year × month instead of same firm × year. In total, there are 152,265 observations where secondary market trades for at least one secured and one unsecured bond issued in the past by the same firm occur in a given year and month.

Similar to the analysis of loan origination and bond issuance, we run regressions based on equation (1). However, with the TRACE data we can also incorporate firm × year × month fixed effects. We report the results in Table IV. The dependent variable in these regressions is the difference between the implied yield from secondary trade prices and the yield on a maturity-matched treasury.

In column (1), we include year × month fixed effects in addition to bond characteristics. Similar to the results documented in Tables II and III, the coefficient on *Secured* is positive (91.4 basis points) and statistically significant. The addition of firm fixed effects in column (2) flips the sign of the coefficient on *Secured* from positive to negative. The spread on secured bonds is now 45.2 basis points lower compared to unsecured bonds. Interestingly, we find this significant negative effect even before we include firm × time fixed effects. This is because the selection problem over time in this setting is mitigated since we are likely to have yields for both secured and unsecured bonds at relatively close points in time. In other words, even if a firm issues secured bonds when its conditions are bad, those bonds could trade in good times as well. There also will be secondary trades in its unsecured bonds that were issued in the past. Take, for example, an extreme case of a firm that always has one secured and one unsecured bond outstanding. To the extent that there is selection in the timing of secured versus unsecured *issuance* but no such selection in secondary *trades* of secured versus unsecured bonds, a simple comparison of spreads implied by trades of all secured and unsecured bonds of the firm should suffer from less serious selection problems.

We correct for any residual effects of issuance timing in column (3), where we include firm × year × month fixed effects to compare implied yields from secondary trades in a given month on bonds that were issued by the same firm in the past. As might be expected, the coefficient estimate on *Secured* is both economically larger in magnitude and statistically more significant than the estimate in column (2). The point estimate suggests that spreads on secured bonds are, on average, 62.6 basis points lower than those of unsecured bonds. There is little that is qualitatively different and noteworthy about the coefficients on other variables, relative to what we saw in Table III, and we will skip the discussion in the interests of space. In what follows, we will use the model correcting for firm × time fixed effects.[14]

[14] Are firms that issue multiple types of bonds different in any way from the rest? They may well be, but our concern is to correct for firm credit quality while estimating the benefit of offering collateral, which our methodology does.

III. Firm Characteristics and Secured Debt Spread

In the last section, we estimated that the secured spread, the difference between the yield on an unsecured bond and the yield on a secured bond issued by the same firm at the same point in time was positive, after we corrected for selection effects. In this section, we start exploring the reasons for the selection bias in greater detail. We begin by focusing on firm characteristics that are potentially correlated with financial constraints. We later analyze the direct effect of credit risk – measured by credit rating – on secured credit spreads.

A. Firm Characteristics and Secured Debt Spread

In this section, we examine the relation between secured credit spreads and firm characteristics. To do this, we estimate the following regression specification using TRACE data on secondary market prices for bonds:

$$spread_{i,j,t} = \alpha * secured_{i,j,t} + \beta * secured_{i,j,t} * Z_{j,t-1} + \theta X_{i,j,t} + \delta_{j,t} + \varepsilon_{i,j,t}, \qquad (2)$$

where $spread_{i,j,t}$ is the spread for bond *i* of firm *j* at time *t*. The variable $secured_{i,j,t}$ is a dummy that equals one if bond *i* is secured, and zero otherwise. $Z_{j,t-1}$ is a vector of firm characteristics measured during the quarter before a trade. The variable $X_{i,j,t}$ controls for bond characteristics, while $\delta_{j,t}$ represents firm × year × month fixed effects. Note that the direct effect of firm characteristics gets absorbed in firm × year × month fixed effects. The key coefficient of interest is β that measures the change in the secured spread for a unit change in firm characteristics.

We report the results of this analysis in Table V, where in columns (1)-(5) we interact one firm characteristics at a time; firm size, firm age, profitability, leverage, and tangibility, while in column (6) we include all the interactions together. Recollect *size* is measured as the log of the total value of assets in millions of dollars, *age* is number of years since the firm's first entry in Compustat, *ROA* is calculated as operating income divided by total assets, *leverage* is total debt divided by total assets, and *tangibility* is the proportion of property, plant, and equipment to total assets.[15] Firm characteristics are measured at the end of the quarter before bond trades.

There could well be reasons unrelated to underlying business why firms issue multiple kinds of debt, such as targeting different clienteles in the DealScan data or issuing at different points in time in the Mergent data.

[15] We winsorize these variables at the 1st and 99th percentiles.

For brevity, we will only discuss the estimates in column (6). The coefficient on *size* interacted with *secured* is positive and statistically significant, suggesting that the benefit from pledging security is decreasing in firm size (the baseline coefficient on *secured* is negative). A one standard deviation increase in firm *size* is associated with a reduction in the spread gap between unsecured and secured bond of 50 bps. The coefficients on the interaction term of *secured* with firm *age* is negative – perhaps the varying age of assets in older firms enhances the value of being secured by a specific asset. The interaction with *ROA* is not statistically significant. The negative coefficient estimate on the interaction term between *secured* and *leverage* suggests that security is particularly valuable for highly levered firms, where the probability of financial distress is higher as is the possibility of inter-creditor conflicts – a one standard deviation increase in firm leverage is associated with a 43 basis points higher spread gap. The coefficient on the *tangibility* interaction is positive, suggesting that firms with a greater proportion of tangible assets likely have a greater proportion of asset value preserved in bankruptcy, so creditors benefit less from being secured by specific assets – a one standard deviation increase in *tangibility* is associated with a 136 basis points lower spread gap.

Finally, we have included an indicator in all the regression specifications for whether a bond is senior. The missing category is therefore whether the bond is subordinate and unsecured. Senior bonds enjoy a 42 basis point lower spread than subordinate unsecured bonds.[16]

In sum, in firms that seem to have a lower probability of financial distress and that have assets that retain value in distress, creditors seem to place a lower valuation on securing their debt. Since these are all inputs into the credit ratings issued by rating agencies, we turn to those next.

B. Firm Credit Quality and Secured Debt Spread

Benmelech, Kumar, and Rajan (2020) show that the ratio of secured debt to assets for firms in Compustat increases with default probability—suggesting that firms issue more secured debt as their financial conditions deteriorate (also see Badoer, Dudley, and James (2020) Colla, Ippolito, and Li (2013), Nini, Smith, and Sufi (2012), and Rauh and Sufi (2010)). We reproduce the result of Benmelech, Kumar, and Rajan (2020) in Figure 3, where we measure a firm's default probability using the Merton distance to default model (see Vassalou and Xing (2004) and Bharath and

[16] Interestingly, the effect of seniority does not vary much with firm characteristics except leverage, unlike security (estimates available from the authors).

Shumway (2008) for a detailed description of the methodology); this default probability reflects both the volatility of a firm's underlying cash flows and the level of its debt. Firms are placed into deciles based on their one-year default probabilities, with firms in decile one having the lowest default probabilities and firms in decile ten having the highest default probabilities. The figure suggests that the median ratio of secured debt to assets increases up to the decile closest to default, and then it dips slightly.

Let us turn now to ratings, another measure of credit quality and proximity to distress. We obtain issuer ratings from S&P Capital IQ. Since many firms that rely on the syndicated loan market do not have issuer credit ratings, we focus in this section on bond issuers, using data from Mergent and TRACE.

We begin by analyzing secured spread at issuance for bonds issued by investment grade and non-investment-grade firms.[17] We report the results of this analysis in Table VI, including firm × year fixed effects, as in column (3) of Table III. As reported in column (1), the coefficient of *Secured* in the subsample of investment grade bonds in the Mergent data set is small and statistically insignificant – suggesting that investment grade issuers do not find that securing debt reduces rates. On the other hand, the coefficient of *Secured* in the non-investment-grade subsample suggests that non-investment-grade issuers reduce their cost of debt by a statistically significant 55.3 basis points.[18] Similarly, columns (3) and (4) examine secured spread for investment grade and non-investment-grade issuers using TRACE, and they suggest a similar conclusion, with the coefficient for investment grade bonds small and insignificant, whereas the coefficient for non-investment-grade bonds is −129 basis points and significant at the 1% level.

Next, we exploit the richness of TRACE secondary trade data to further examine secured spread across firm quality in a more granular manner. We split our TRACE sample into five mutually exclusive groups based on the issuer's S&P credit rating at the time of trade: (i) AAA to

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[17] Firms with an S&P rating of BBB− or better are considered investment grade.

[18] The discussion of credit quality also allows us to address one concern readers may have, despite our attempt at addressing the selection issues: is it possible that firms that issue both secured and unsecured bonds within a short time span are different in quality from other secured issuers in our sample? After all, although 15% of bonds in our sample are secured, our tight identification of secured spread comes from the 706 observations in which the same firm issued both secured and unsecured bond in the same year. We look at the distribution of secured plus unsecured issuers (from whom our spread is identified) against the remaining secured issuers across rating buckets. The Pearson's chi-squared test cannot reject the null hypothesis that the distribution of firms in each of the two categories (only secured vs both secured and unsecured) was drawn from the same underlying data generating process.

A−, (ii) BBB+ to BBB−, (iii) BB+ to BB−, (iv) B+ to B−, and (v) CCC+ to CCC−. We then estimate the following regression specification:

$$spread_{i,j,t} = \sum_{k=1}^{5} \beta_k * secured_{i,j,t} * rating\_group\_k_{j,t} + \theta X_{i,j,t} + \delta_{j,t} + \varepsilon_{i,j,t}, \qquad (3)$$

where $rating\_group\_k_{j,t}$ (k=1, 2…5) are a set of dummies that equal one when firm j at time t belongs to rating group k, and zero otherwise. All other variables are defined as before. The direct effect of the ratings dummy gets absorbed by firm × year × month fixed effects ($\delta_{j,t}$). In Figure 4A, we plot the *negative* of the coefficients on the five secured dummies (β_k), representing secured spreads for firms belonging to each of the rating categories.[19] As can be seen from the figure, collateralizing a bond does not seem to affect its credit spread until firm quality is BB+ and below. Spreads on secured bonds are 110 basis points lower than spreads on unsecured bonds for firms in the B+ to B− rating range. For firms of lower quality – CCC+ or worse – the value attached to having a bond with security, as measured in the secondary market for bonds, seems to increase further. In particular, spreads on secured bonds are almost 270 basis points lower than spreads on unsecured bonds for firms in the CCC+ to CCC− ratings range. In terms of statistical significance, the estimates for the first two ratings ranges are statistically indistinguishable from zero, whereas the estimates for the BB+ to BB−, B+ to B−, and the CCC+ to CCC− rating ranges are all statistically significant at the 1% level.

Next, we compare the secured spread for firms that move between two adjacent rating groups during our sample period (we allow the firm to transition to other rating groups during the sample period, in addition to the two adjacent groups in focus). The idea is to estimate the secured credit spread conditional on credit rating transitions. Specifically, we estimate the following regression specification:

$$spread_{i,j,t} = \alpha * secured_{i,j,t} + \beta * secured_{i,j,t} * worse\_rating\_group_{j,t} + \theta X_{i,j,t} + \delta_{j,t} + \varepsilon_{i,j,t}, \qquad (4)$$

where $worse\_rating\_group_{j,t}$ is a dummy that equals one if firm j at time t belongs to the worse of two adjacent rating groups. To estimate this, we keep only firms that transited between both rating groups over the sample period (including those that fell and those that rose). We have

[19] We define *secured spread* as the difference between the yield on an unsecured bond and the yield on a secured bond, and hence equals -β_k.

secondary prices for both secured and unsecured bonds in each of the two adjacent rating groups. Therefore, -α measures the secured spread for the higher rating group, whereas -β measures the incremental secured spread when the same firm falls to the lower rating group.

The coefficients on $secured_{i,j,t} * worse\_rating\_group_{j,t}$ are plotted in Figure 4B. The results suggest that as firms move from a BBB rating to a BB rating, the spread on secured bonds falls by an *additional* 92 basis points relative to the spread on unsecured bonds. The coefficient is statistically significant at the 1% level. Similarly, as firms move from a BB rating to a B rating in Figure 4B, the spread on secured bonds falls by an *additional* 21 basis points relative to the spread on unsecured bonds. Finally, as firms move from a B rating to a CCC rating, the spread on secured bonds falls by an *additional* 131 basis points relative to the spread on unsecured bonds. The coefficient is statistically significant at the 5% level. There does not seem to be any incremental effect of security on spread as firm rating deteriorates from A to BBB.

IV. Secured Debt and the Business Cycle

We have seen the impact of security on the spread increases as a firm's credit quality declines. We now examine the issuance of secured debt over the cycle, and relatedly, the behavior of the secured credit spread over the business cycle. Consistent with the selection effects noted earlier, we would expect more issuance as economic and financing conditions deteriorate, especially for non-investment-grade firms.

A. Secured Debt Issuance and the Business Cycle

We begin by examining cyclical pattern in the issuance of secured debt. Using the Mergent bond issuance data, we estimate the following regression for the period 1980 to 2018:

$$secured\ issuance_{i,j,t} = \beta Z_t + \gamma NonIG_{j,t} \mathrm{Z}_t + \theta X_{j,t} + \delta_j + \varepsilon_{i,j,t}, \qquad (5)$$

where $secured\ issuance_{i,j,t}$ is an indicator variable that equals one if bond i of firm j issued at time t is secured, and zero otherwise. Z_t represents a business cycle proxy. We use two measures for the cycle: the Baa–Aaa credit spread – a commonly used measure of financial conditions – and real gross domestic product (GDP). $NonIG_{j,t}$ is a dummy that equals one if the firm has a non-investment-grade ratings, and zero otherwise. The variable $\mathrm{X}_{j,t}$ controls for time-varying firm characteristics such as credit rating. Finally, δ_j represents firm fixed effects to account for time-invariant firm heterogeneity.

We report the results of this analysis in Panel A of Table VII. The coefficient on Baa-Aaa spread in column (1) is small and statistically insignificant, suggesting that investment grade firms do not base their choice of secured vs unsecured issuance on market conditions. The coefficient on the interaction term, Non-IG × Baa-Aaa spread, is 0.148 and statistically significant at the 1% level. The coefficient suggests that one standard deviation increase in Baa-Aaa spread increases the probability of secured issuance by a non-investment grade firm by an additional 5.2 percentage points (compared to investment grade issuers) – a 23.7% increase from the unconditional probability of 0.219. Similarly, the coefficient on GDP growth in column (2) is small and insignificant, suggesting that economic conditions do not influence choice of issuance for investment grade firms. However, the interaction term, Non-IG × GDP growth, equals -3.678 and is statistically significant at the 1% confidence level. The coefficient suggests that one standard deviation fall in GDP growth increases the probability of secured issuance by a non-investment grade firm by an additional 5.3 percentage points (compared to investment grade issuers) – a 24.2% increase from the unconditional probability of 0.219.

In columns (3) and (4), the dependent variable is the dollar share of secured bond in aggregate monthly bond issuances, calculated separately for investment and non-investment grade issuers each month. The results paint a similar picture. The coefficient on the interaction term in column (3) suggests that one standard deviation increase in Baa-Aaa spread increases the secured share for non-investment grade firms by an additional 3.6 percentage points (compared to investment grade issuers) – a 14.4% increase from its unconditional mean of 0.253. Similarly, the interaction term in column (4) suggests that a one standard deviation fall in GDP growth increases the secured share for non-investment grade firms by an additional 4.3 percentage points (compared to investment grade issuers) – a 16.8% increase from its unconditional mean of 0.253. Overall, our analysis suggests that secured bond issuance is countercyclical for non-investment grade firms. Interestingly, investment grade firms' issuance choices do not seem to be influenced by market or economic conditions. We will suggest an explanation of all this in the next section. Before we do so, we examine the behavior of secured spread over business cycle in the next subsection.

B. The Cost of Secured Debt Issuance and the Business Cycle

Having established that the issuance of secured bonds is countercyclical, we next use Mergent's bond issuance data to examine how the cost of secured debt changes over the business cycle. We estimate the following regression specification:

$$spread_{i,j,t} = \alpha * secured_{i,j,t} + \beta * secured_{i,j,t} * business\_conditions_t + \theta X_{i,j,t} + \delta_{j,t} + \varepsilon_{i,j,t}, \quad (6)$$

where $spread_{i,j,t}$ is the spread for bond *i* of firm *j* at time *t*. The results of this analysis are presented in Panel B of Table VII. In column (1), we examine how secured bond spread varies with the Baa–Aaa credit spread. Note that the direct effect of monthly credit spread on bond spread gets absorbed by year × month fixed effects. The key variable of interest is the interaction term *Secured* × *Baa–Aaa spread*. The coefficient on the interaction term is negative and statistically significant at the 5% confidence level. In terms of economic magnitude, the coefficient suggests that a one standard deviation increase in the Baa–Aaa spread reduces the spread on secured bonds by an additional 13 basis points relative to the spread on unsecured bonds issued by the same firm in the same year. Similarly, the coefficient in column (2) suggests that one standard deviation fall in real GDP growth reduces the spread on secured bonds by an additional 5.6 basis points relative to the spread on unsecured bonds issued by the same firm in the same year.

Overall, the analysis suggests that collateral becomes more valuable as business conditions deteriorate – firms are more likely to use secured borrowing during an economic downturn, and such borrowing seems to provide a significantly lower cost of debt under adverse economic conditions compared to unsecured borrowing.

V. Spreads and Issuance: A Theory of Collateral Use

We have documented that the magnitude of the secured spread is larger for riskier firms, grows as firms get closer to distress, and increases in business cycle downturns. We also find that firms tend to issue secured bonds when they have low ratings and in business cycle downturns – that is, when the economy is doing badly. In one sense, the link between the two phenomena may seem obvious – firms issue secured bonds when the secured spread increases following a rise in the probability of default. But if backing a bond with collateral reduces bond spreads appropriately, there is no obvious reason why secured bonds should be issued only when the probability of default rises. In a Modigliani Miller world, firms should be indifferent as to when they issue secured debt. In a world with agency problems, levered firms should positively want to issue secured debt to reduce agency problems (Stulz and Johnson (1985)) and even to dilute prior debt (Donaldson, Gromb and Piacentino (2019)). Why then do they hold off issuing it?

A. Is Secured Debt Underpriced?

Even though the secured spread seems related to the price of default, perhaps it is the case that secured debt is undervalued by the market? Assuming the loss given default for secured debt relative to unsecured debt is constant over time for a particular firm credit rating, we can show (see appendix B)

$$\text{Secured Spread} = p(LGD_{Unsecured} - LGD_{Secured}) \qquad (7)$$

where p is the one-year-look-ahead probability of default for that rating category and LGD is the loss given default. We can estimate the secured spread for each firm over time from the TRACE secondary bond trading dataset, and we can estimate the probability of default either using the Merton model, or from actual defaults in that rating category in the following year. So in each year, we can compute *Secured spread/p* for each firm. From (7), this equals the percentage by which the loss given default of unsecured bonds exceeds secured bonds. We term this the LGD Advantage of security. We do not know what this should be but we do know that it should not be higher than 100% if the bond is fairly priced -- the secured bond can, at best, recover 100 percent while the unsecured bond can at worst be a total write-off. If the LGD Advantage is higher, it would suggest that the rate reduction a firm would get by issuing a secured bond rather than an unsecured bond exceeds what might be suggested simply by the expected improvement in loss given default from securing debt.

In Figure 5A, we present the fraction of firms for which the LGD advantage exceeds 100%, separately for the investment grade category and non-investment grade category, using the estimated probability of default from the Merton model.[20] In Figure 5B, we use the S&P one-year-ahead realized probability of default as a proxy for p for each rating category. What is clear is that for the firms that issue secured bonds the least – the investment grade ones – the apparent advantage of issuing secured bonds seems high (there are many more years in which the LGD Advantage is greater than 100% for all the firms for which we have data), which makes the question of why they don't issue even more puzzling.

Indeed, when we plot the fraction of firms for which the LGD advantage exceeds 100% for the BB, B, and CCC rating categories in Figure 5C using S&P one-year-ahead realized probability

[20] For instance, we divide the secured spread for a firm rated CCC by the realized one year default rate for CCC bonds to get the LGD Advantage for that firm. We then calculate the fraction of firms in the particular category who have an LGD Advantage greater than 100%.

of default, we find that a far smaller fraction of firms have ratios exceeding 100 percent for CCC rated firms. Secured bond seems to be more reasonably priced for low rated firms that tend to be the most reliable issuers of secured bonds, while it seems to be overpriced for higher rated issuers that issue less frequently.

There are some ways our methodology may introduce errors, but the errors should typically be small, and be relatively larger for lower rated bonds.[21] Yet higher rated bonds seem more "mispriced", at least in light of our methodology. If indeed it would be advantageous for higher rated firms to issue such bonds but they do not, we need to ask why.

One possibility is that there is a fixed cost of issuing secured debt, and the small saving in spread, given the lower probability of default for investment grade issuers, is not worth it. While there may indeed be costs of registering or perfecting collateral, it is likely to be small relative to the size of bond issues. It is hard to imagine that it would be sufficient to deter firms from choosing a cheaper form of finance.

It may be that secured issues by highly rated firms are priced generously because they are in low supply relative to demand – if some investors have a "preferred habitat" for ultra-safe corporate bonds, they may gobble up any secured issues by highly rated firms. Yet this "preferred habitat" argument would not explain why the marginal better-rated firm does not take advantage of this unmet demand and issue more secured bonds. Why is it only the low rated firms that issue enough to satisfy demand?

That leaves the possibility that there is a cost of issuing secured debt, over and above the interest cost, which is why higher rated firms that can issue unsecured debt prefer not to issue secured. What might this cost be? Adverse selection costs are usually the reason firms forego issuing a type of security, yet secured debt issued by a healthy firm is less likely to suffer from the usual adverse selection costs (compared to unsecured debt).

[21] To derive (7) in Appendix B, we assume the rate at which repayments from the secured and unsecured bond are discounted is equal. This is likely to not make much of a difference if investors are not very risk averse or if the bond has low default risk. Also, the secured spread may overstate the value of issuing secured debt. Ideally, we should be comparing the reduction in spread from issuing a secured bond and issuing an unsecured bond, ceteris paribus. But the measured secured spread captures the difference between a secured bond and an unsecured bond which is further behind in priority (because of the issuance of the secured bond). If an unsecured bond was issued instead, the yield on the prior unsecured debt would not be pushed up so much. The advantage of issuing secured is the difference in rate between a newly issued secured bond and a newly issued unsecured bond, ceteris paribus. The secured spread is a proxy for it, a proxy that gets more exact the less risky the firm is. So both errors should be smaller, not larger, for highly rated firms.

Instead, following Rampini and Vishwanathan (2010, 2013), we conjecture that unused collateral is a form of slack or insurance that firms like to preserve if they can issue other forms of debt. They use collateralized debt only when new funds are desperately needed – for instance to avert costly bankruptcy – and other avenues to raise capital have shut down. The lack of alternative funding sources, and the high marginal value of any funds at such a juncture, may explain why firms preserve their collateral in normal times despite the tempting pricing of secured debt.

B. The Pandemic Sudden Stop.

The likely sudden stop imposed on risky unsecured corporate bond issuance in the early phases of the coronavirus pandemic offers us a case study of this phenomenon at work. Before the Federal Reserve stepped in on March 23 2020 with a wide range of measures intended to calm financial markets, all manner of risk premia increased as the widespread impact of the coronavirus pandemic in the United States became better understood. The Moody's BAA Corporate Bond spread over to 10 year Treasuries went up from 210 basis points in early February to peak at 431 on March 23rd.[22] For B rated bonds, the spike was even more dramatic, with the spread going from 402 to 1189.[23] After March 23rd, and as the Federal Reserve continued fine-tuning these measures over April and May, risk spreads came down. The BAA-Treasury spread was down to 260 basis points by end July. For B rated bonds, it went back down to 539.

We estimate the secured spread over this period, separately for investment grade and non-investment grade firms in Figure 6. Secured spreads on investment grade firms continued to be close to zero during this period. In contrast, for non-investment grade firms, secured spreads increased from 40 basis points in January to 165 basis points in April before falling to 78 basis points by June.

The difference in behavior of the secured spreads for different categories of firms is interesting. It probably reflects differential access to the markets. Markets were open to unsecured investment grade bond issuances. In Figure 7, we display the value of aggregate bond issuances at the monthly frequency from Jan 2019 to June 2020. The issuance of corporate bonds by investment grade firms during March, April, May and June of 2020 was 406%, 184%, 63% and 226% higher, respectively, compared to the same months of 2019, and they were predominantly unsecured. This

[22] https://fred.stlouisfed.org/series/BAA10Y
[23] https://fred.stlouisfed.org/series/BAMLH0A2HYB

suggests the rise in yields for investment grade bonds was probably because of liquidity pressures in the market, given the enormous issuance, than because of a rise in default probabilities.

On the other hand, corporate bond issuance by non-investment grade firms declined in March of 2020 relative to the previous year, highlighting the difficulties riskier firms face in raising financing during bad times, especially if they want to issue unsecured debt. Indeed, given the low issuance of unsecured bonds relative to the norm (and assuming a normal clientele exists for non-investment grade bonds), it is hard to argue that liquidity was the reason spreads blew out so much. Instead, it must be that fears of default and the shutdown of access to the unsecured bond market fed on each other. The higher probability of default increased the secured spread in traded bonds for this class of firms, making secured bond issuance the most attractive, and indeed perhaps the only way to raise financing for most low rated firms in April.

Perhaps as a result, even though we see corporate bond issuance by non-investment grade firms rebounded in April and continued to be strong during May and June, it was almost entirely secured in April and secured bonds still formed the majority of issuance in May and June as financial conditions eased. Secured issuance by non-investment grade firms in April was more than double the amount issued in any month in the past year. On the other hand, the fraction of unsecured bond issuance was relatively low, suggesting this source of financing was difficult and costly to access.

Simply put then, when there are few secured bond issues, the measured LGD advantage of secured bonds seems high, in part because there are very few secured bond issues to quench any habitat demand. Yet firms do not want to issue more because they have access to the unsecured bond market. If access to the unsecured bond market shrinks for a certain category of firm, typically when the probability of default rises, the firm is forced to issue more secured bonds. The secured spread increases because of the higher probability of default, and the LGD advantage of secured bonds falls because more such bonds are issued into the market.

What this case study suggests is that the variations in the secured spread are small and matter little in the issuance decision for investment grade firms, even when financial markets tighten. They have access to unsecured bond markets and have little desire to use up scarce collateral when not needed – even if unsecured spreads rise for liquidity reasons. Matters are different for lower rated non-investment grade firms. For them, a rise in the secured spread reflects a difficulty in accessing unsecured bond markets and a rise in the probability of default, and variations in the secured spread should be more strongly correlated with issuance decisions.

C. The Issuance Decision

To investigate whether the magnitude of the secured spread correlates more generally with the lack of access of non-investment grade firms to unsecured bond markets, we analyze the timing of bond issuances in Table VIII and investigate how it correlates with the secured spread. We estimate the following regression specification:

$$secured\ issuance_{i,j,t} = \beta * secured\ spread_t + \gamma Z_{j,t} + \delta_j + \varepsilon_{i,j,t}, \tag{8}$$

where $secured\ issuance_{i,j,t}$ is an indicator variable that equals one if bond i of firm j issued at time t is secured, and zero otherwise. The variable $secured\ spread_t$ represents the monthly estimates of secured spread by running regression Eq. (1) using the TRACE bond trading data. To avoid simultaneity bias, we drop bonds issued in a month in the estimation of that month's secured spread. The variable $Z_{j,t}$ controls for time-varying firm characteristics such as credit rating. Finally, δ_j represents firm fixed effects to account for time-invariant firm heterogeneity.

Highly rated firms typically do not see markets close to their unsecured issues, and would not be influenced by the secured spread. In contrast, lower rated firms would be impelled to access the secured bond market when secured spreads are greater, and the higher implied probability of defaults makes it harder to access unsecured bond markets. Table VIII reports results of this analysis. In Panel A, we look at the secured issuances of the sample of firms that are non-IG. The coefficient on secured spread in column (1) is positive and statistically significant at the 1% confidence level. The coefficient suggests that a 100 basis points increase in secured spread is associated with a 4.3 percentage point increase in the chances that a bond issuance will be secured – a 15.9% increase from the unconditional probability of 0.27. The inclusion of ratings fixed effects in column (2) yields similar results, suggesting that holding a firm's fundamentals constant, an increase in secured spreads is associated with a firm tapping its secured debt capacity and issuing a secured bond.

While we view our secured spread measure as specifically measuring market's preference for security as financial conditions change over time, it is possible that the variation in secured spread has no additional information beyond simple measures of credit conditions such as the Baa-Aaa credit spread. In column (3), we include the Baa-Aaa credit spread measure as an additional control and continue to find an economically strong and statistically significant effect of secured spread on secured bond issuance choice. Similarly, in column (4), we use information from Senior Loan Officer Opinion Survey and control for tightening standards for commercial and industrial loans to large and middle-market firms. We continue to find a strong effect of our secured spread measure in influencing firm's choice of secured vs unsecured bond issuance. Finally, we include real GDP growth rate in column (5) to control of underlying economic conditions and continue to find that secured spread can independently explain speculative grade firms' choice of secured vs unsecured bond issuances.

In Panel B, we repeat the same analysis for investment grade issuers. The coefficients on secured spread in all five specifications are small and statistically indistinguishable from zero, suggesting that investment grade borrowers do not base their issuance decision on the secured spread in the market.

D. Discussion

The analysis suggests that firms tend to view collateral as precious, not to be used in the normal course but as a lifeline. Highly rated firms eschew the issuance of secured debt**.** Variations in the secured spread, albeit small, have little influence on their issue decision.

In contrast, low rated firms tend to have fewer options and are driven to issue secured debt both when financial markets tighten and when economic conditions are adverse. The secured spread is positively associated with secured debt issuance by such firms. Given the limited access to other forms of borrowing than secured debt in adverse times, they attempt to preserve collateral in normal times. This is not to say they are indifferent to the benefits of issuing higher priority claims to reduce adverse selection (see Myers-Majluf (1984)). Their reliance on senior unsecured debt issuance in normal times might reflect how they trade-off the cost reduction associated with issuing high priority claims versus the insurance benefit of holding back super-high priority collateral for use in times of extremis. Indeed, this is precisely what Badoer, Dudley, and James (2020) and Rauh and Sufi (2010) document in the phenomenon of "priority spreading" by distressed firms.

VI. Conclusion

We find that corporate borrowers are reluctant to issue secured debt to lenders in the United States when a firm is far from distress or the economy is healthy. As a firm nears distress or the economy deteriorates, access to unsecured debt markets becomes more difficult and costly. Firms then use the lifeline provided by available collateral to issue debt and access funding. It is precisely to have a source of ready funding in bad times that they avoid the temptations of issuing secured debt in good times or when they are highly rated.

There is a broader point here. A firm's assets may be important in reassuring lenders that they can collect repayment when financial infrastructure is underdeveloped – as Benmelech, Kumar, and Rajan (2020) suggest was true in the United States in the early years of the twentieth century, or as is still true in a number of countries across the world today. Collateral will be "priced" then even in the normal course, and loan documents will emphasize the importance of assets. As Lian and Ma (2019) show, Japan still emphasizes asset based lending.

However, giving lenders power over assets comes at a cost (see, for example, Mello and Ruckes (2017)). As a result, with financial development, borrowers would like to retain full control over assets in the normal course, while lenders are willing to rely on structures that give them control on a contingent basis (Aghion and Bolton (1992)). Financial development may make such contingent issuance of collateral possible, for example through the effective enforcement of negative pledge clauses that prevent the borrower from issuing secured debt to a favored party without issuing it to all others (see Benmelech, Kumar, and Rajan (2020) and Donaldson, Gromb, and Piacentino (2019)). Collateral may then not be pledged to back loans or bonds issued by healthy firms, given that lenders have the ability to take collateral when truly needed, and can trust the contractual system to ensure that it will not have already been pledged away when they want it.

A number of avenues are worth exploring. Does the pricing of collateral differ between industries in which reorganization is the norm in bankruptcy and industries in which liquidation is the norm (see the arguments in Lian and Ma (2019))? Also, is liquidity (alternatively, creditor risk tolerance or optimism) as reflected in the stage of the financial cycle (see Borio (2014) and Diamond, Hu, and Rajan (2020)), a factor in the value creditors see in protecting themselves with collateral? There is ample scope for additional research.

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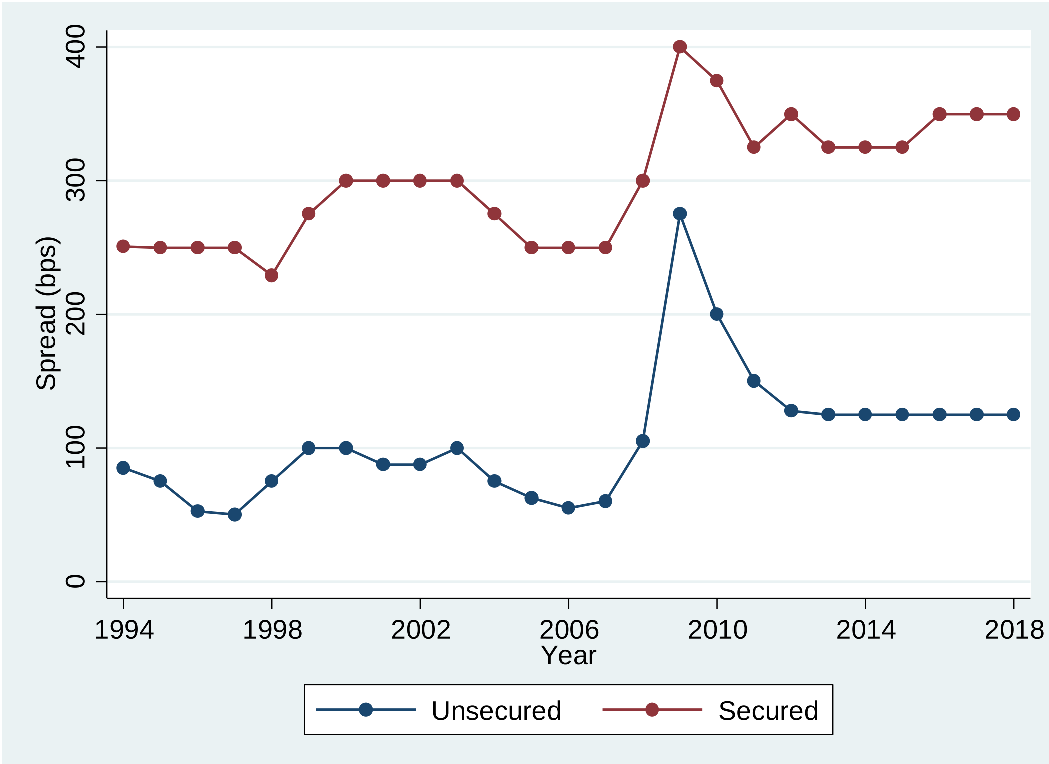

Figure 1. Loan spread – secured versus unsecured. This figure displays the median spread over LIBOR at issuance for secured and unsecured loans by year of issuance. Source: DealScan.

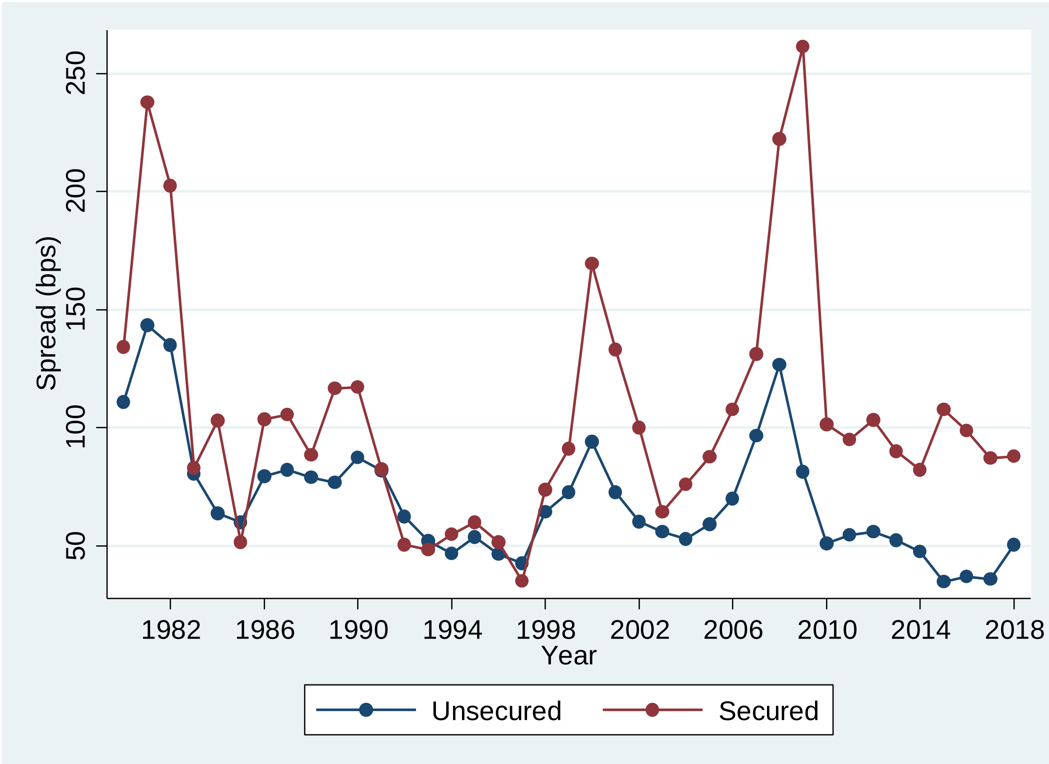

Figure 2. Yield spread – secured versus unsecured bond. This figure displays the median yield spread at issuance over maturity-matched treasury for secured and unsecured bonds by year of issuance. Source: Mergent.

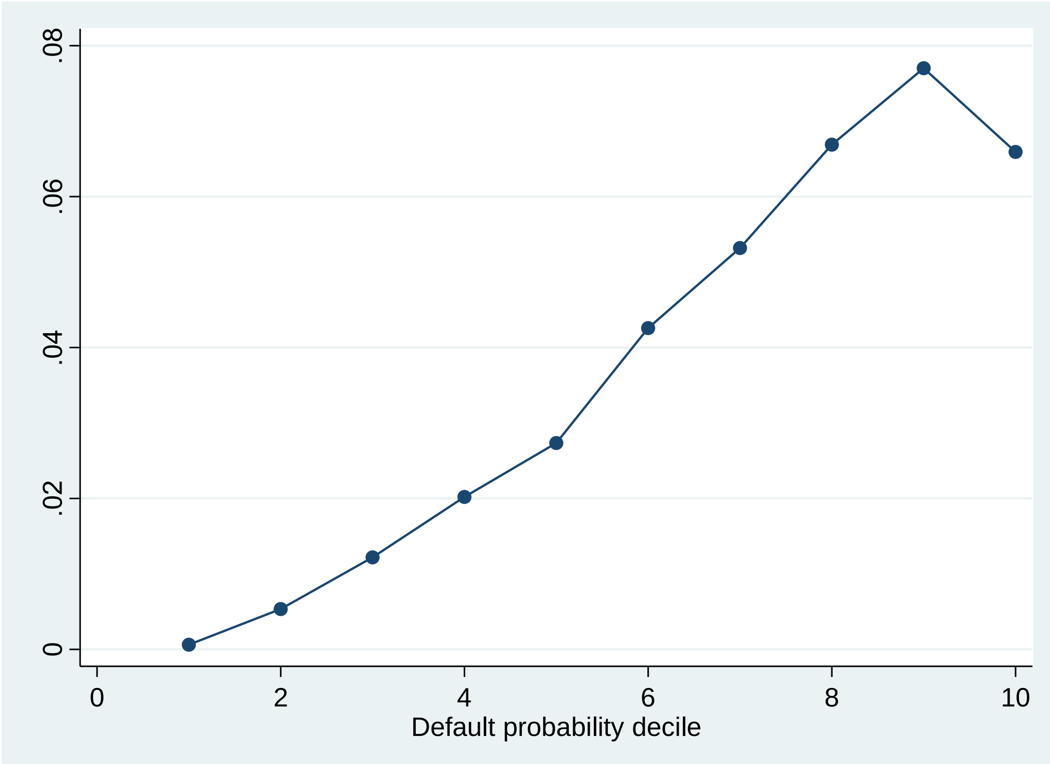

Figure 3. Secured debt and firm quality. This figure plots the median share of secured debt to total book value of assets for firm-year observations in Compustat from 1981 to 2017 for different one-year default probability deciles. One-year default probability is calculated using the Merton distance to default model. The default probability incorporates both the volatility of a firm's asset value and the level of its debt. Firms are grouped into ten deciles based on their default probability, and the median share of secured debt to assets is calculated for each group. Source: authors' calculations using Compustat data.

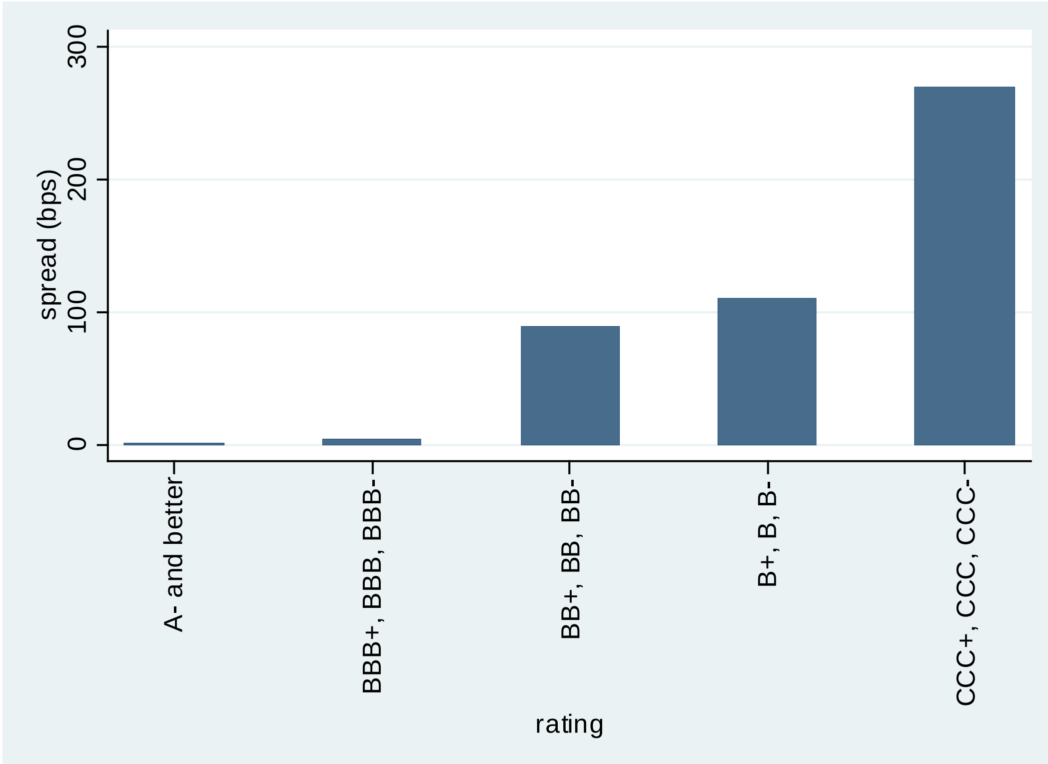

Figure 4A. Implied secured yield spread by issuer rating categories. This figure reports results from the following regression:

$spread_{i,j,t} = \sum_{k=1}^{5} \beta_k * secured_{i,j,t} * rating\_group\_k_{j,t} + \theta X_{i,j,t} + \delta_{j,t} + \varepsilon_{i,j,t}$,

where $rating\_group\_k_{j,t}$ (k=1, 2…5) is a set of dummies that equal one when firm *j* at time *t* belongs to rating group *k*, and zero otherwise. The figure displays the secured spread for each rating category, i.e., the negative of coefficients on the secured dummy interacted with the issuer's S&P rating group dummy ($-\beta_k$). Spread is measured as the difference between the implied yield from the secondary trade price and a maturity-matched treasury. The regression controls for seniority, maturity, callability, loan amount, and presence of covenant. Note that the direct effect of issuer rating gets absorbed by firm × month fixed effects. Source: TRACE.

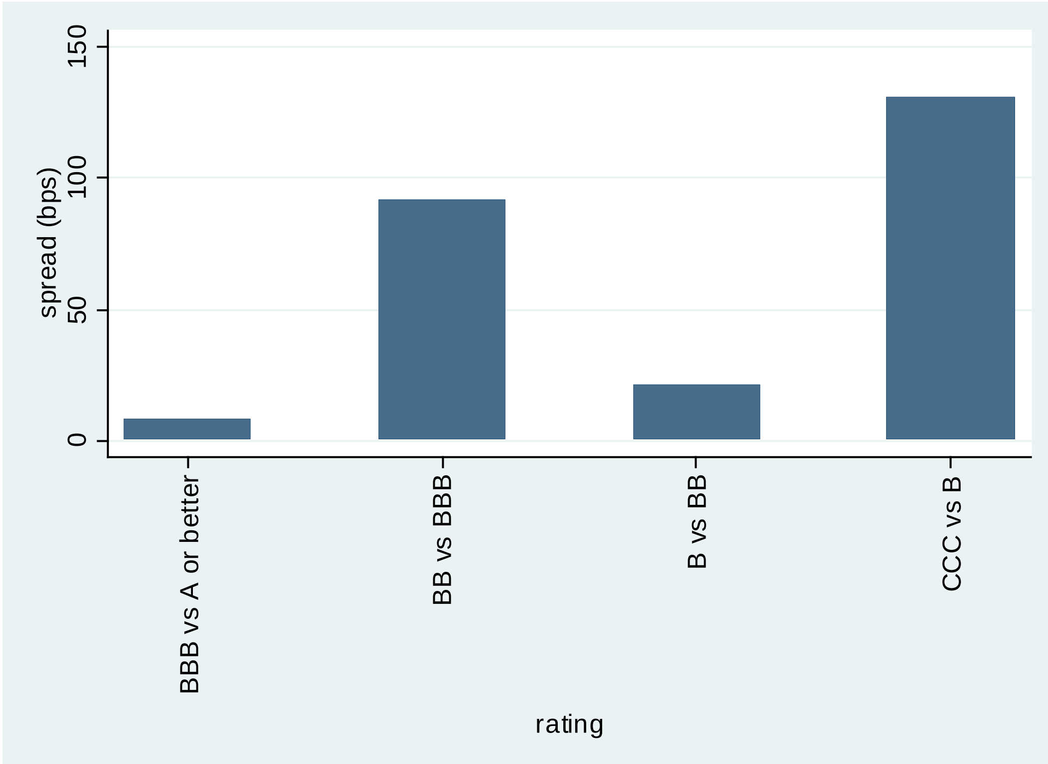

Figure 4B. Incremental implied secured yield spread between adjacent issuer rating categories. This graph reports results from the following regression:

$$spread_{i,j,t} = \alpha * secured_{i,j,t} + \beta * secured_{i,j,t} * worse\_rating\_group_{j,t} + \theta X_{i,j,t} + \delta_{j,t} + \varepsilon_{i,j,t} \ ,$$

where $worse\_rating\_group_{j,t}$ is a dummy that equals one if firm j belongs to the worse of two adjacent rating groups at time t. The figure displays the change in secured spread by moving to the worse of two adjacent issuer rating categories, i.e., the negative of coefficient on secured dummy interacted with a dummy for worse issuer S&P rating group $(-\beta)$. Spread is measured as the difference between implied yield from secondary trade price and a maturity-matched treasury. The regression controls for seniority, maturity, callability, loan amount, and presence of covenant. We run a separate regression for each pair of adjacent broad rating groups. For each regression, we restrict the sample to firms that have secondary trade prices for both secured and unsecured bonds in both rating groups. Note that the direct effect of issuer rating gets absorbed by firm × month fixed effects. Source: TRACE.

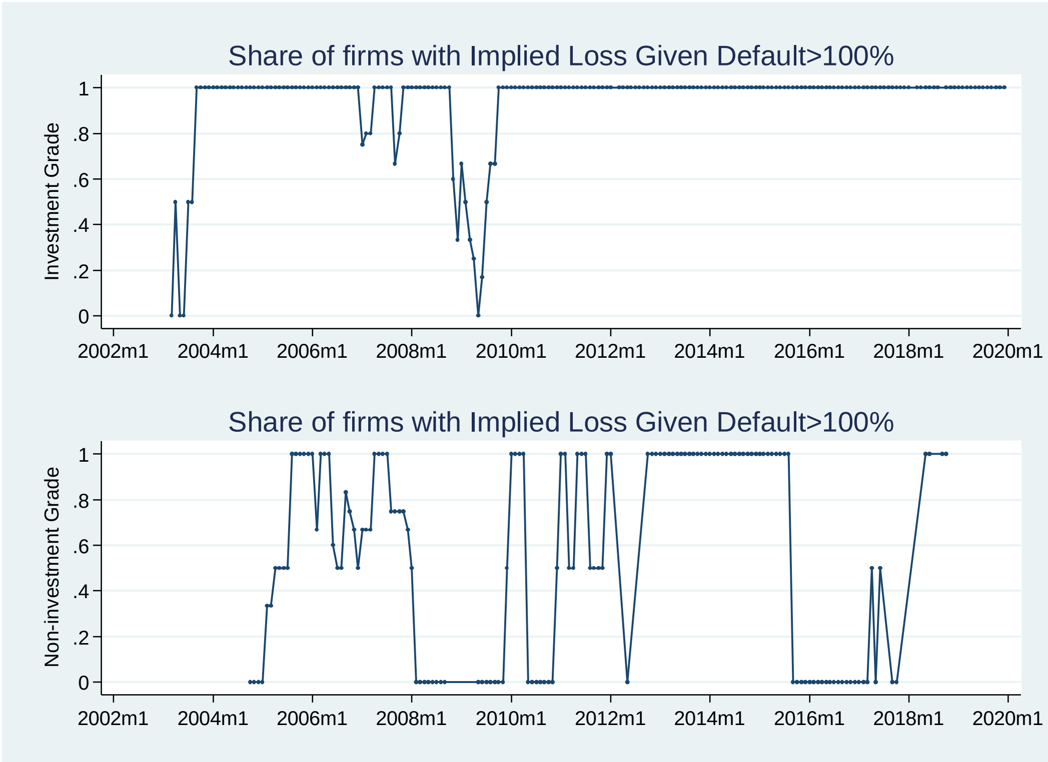

Figure 5A. Implied Loss Given Default - Merton. This graph plots at the monthly frequency the fraction of firms for which the implied loss given default (LGD) advantage exceeds 100%, separately for investment grade and non-investment grade firms. LGD advantage is the difference in loss given default for a secured and an unsecured bond belonging to the same firm. We calculate the implied LGD advantage for each firm by dividing that firm's estimated secured spread by the firm's Merton one-year default probability.

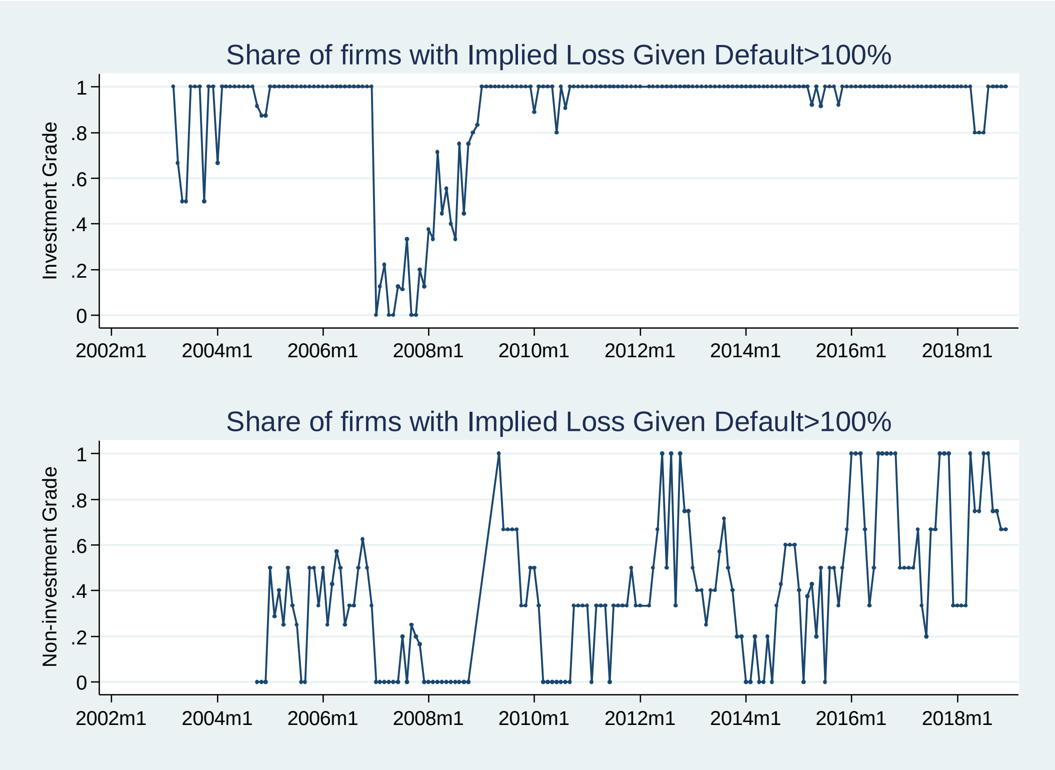

Figure 5B. Implied Loss Given Default – S&P. This graph plots at the monthly frequency the fraction of firms for which the implied loss given default (LGD) advantage exceeds 100%, separately for investment grade and non-investment grade firms. LGD advantage is the difference in loss given default for a secured and an unsecured bond belonging to the same firm. We calculate the implied LGD advantage for each firm by dividing that firm's estimated secured spread by the one-year ahead realized probability of default for firms belonging to a particular rating category.

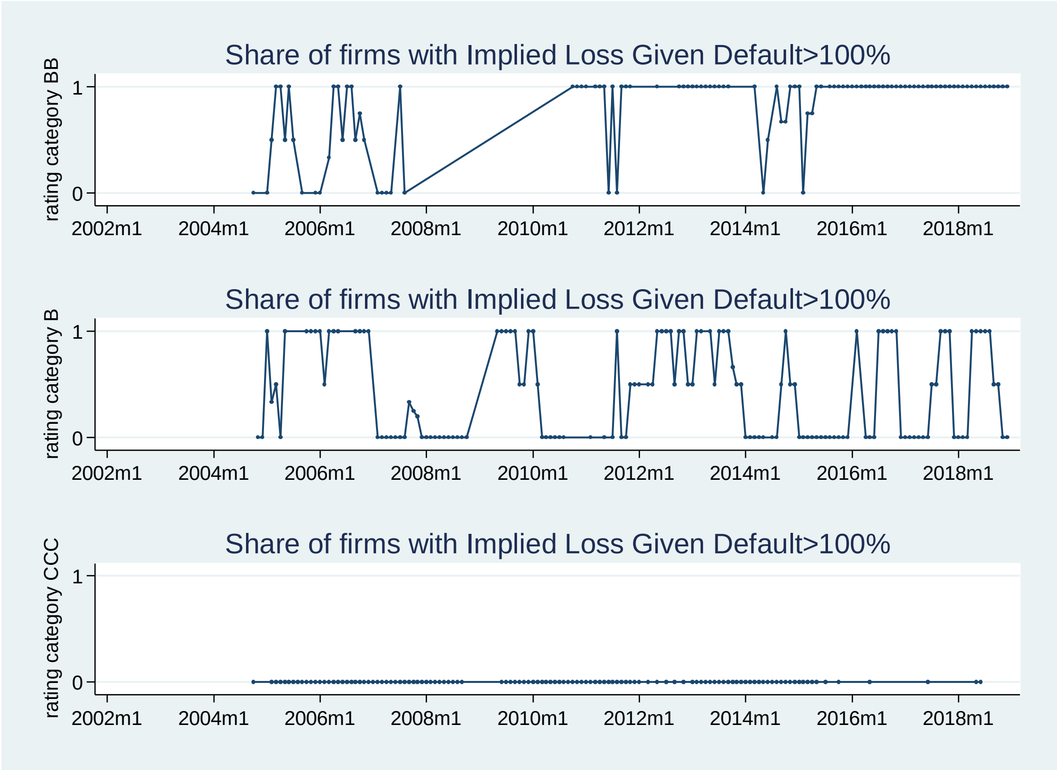

Figure 5C. Implied Loss Given Default for Non-Investment Grade Firms – S&P. This graph plots at the monthly frequency the fraction of firms for which the implied loss given default (LGD) advantage exceeds 100%, separately for BB, B, and CCC rating categories. LGD advantage is the difference in loss given default for a secured and an unsecured bond belonging to the same firm. We calculate the implied LGD advantage for each firm by dividing that firm's estimated secured spread by the one-year ahead realized probability of default for firms belonging to a particular rating category.

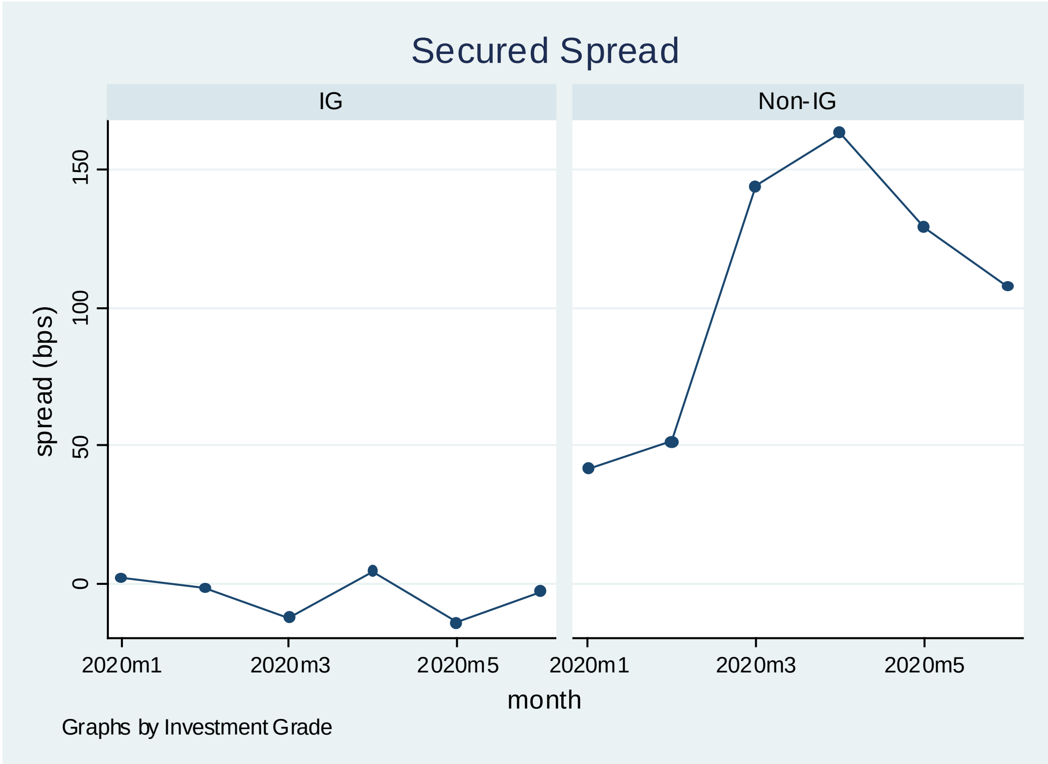

Figure 6. Secured Spread Estimates. This figure displays monthly estimates of secured spread obtained from the following regression run at the monthly frequency:

$$spread_{i,j} = \beta * secured_{i,j} + \theta X_{i,j} + \delta_j + \varepsilon_{i,j},$$

where $spread_{i,j}$ is the spread for bond i of firm j. The variable $secured_{i,j}$ is a dummy that equals one if bond i is secured, and zero otherwise. The variable $X_{i,j}$ controls for bond characteristics, while δ_j represents firm fixed effects.

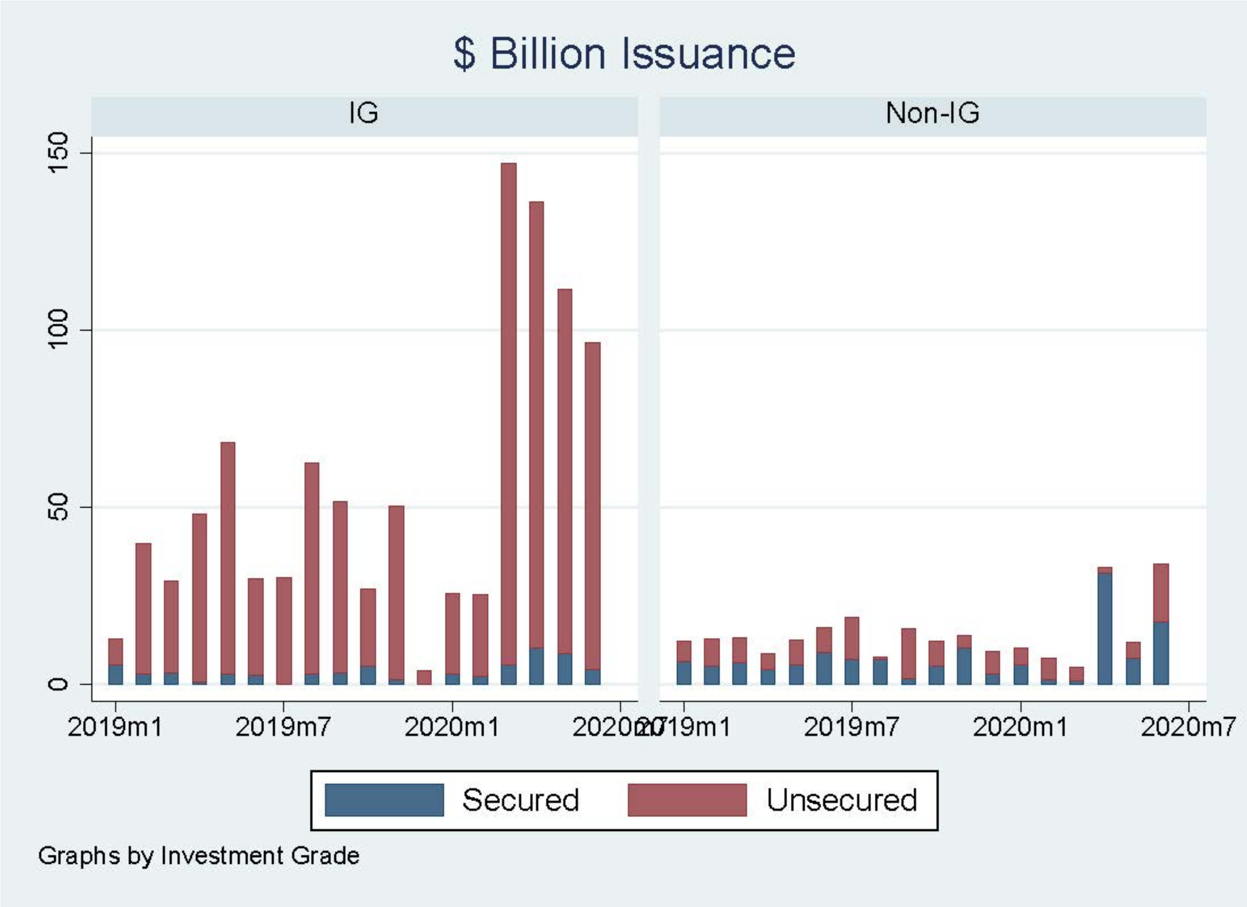

Figure 7. Bond Issuance (2019m1-2020m6). This figure displays the aggregate dollar amount of corporate bonds issued every month from Jan 2019 to June 2020 using data from Mergent FISD database. The panel on the left displays issuance by investment grade issuers while the panel on the right displays issuance by ono-investment grade firms.

Table I

Summary Statistics

This table reports summary statistics for variables used in our analysis. Panel A uses data from DealScan, panel B uses data from Mergent, and panel C uses data from TRACE. Panels A and B tabulate statistics at the debt issuance level, whereas panel C tabulates statistics at the bond trade level. Spread is measured as spread over LIBOR at issuance in panel A, as yield spread at issuance over maturity-matched treasury in panel B, and as the difference between the implied yield from secondary trade prices and the yield on maturity-matched treasury in panel C. Secured is a dummy that takes the value of one if the debt is secured, and zero otherwise. Senior is a dummy that takes the value of one if the debt is senior, and zero otherwise. Maturity is the maturity at issuance in panels A and B and the remaining maturity at the time of trade in panel C. Callable is a dummy that takes the value of one if the bond is callable, and zero otherwise. Amount is the logarithm of the dollar principal amount outstanding at issuance. Covenant is a dummy that takes the value of one if the debt has a covenant, and zero otherwise. Baa–Aaa spread is the monthly credit spread between Baa and Aaa corporate bonds, while GDP growth is calculated as the quarterly growth rate in real GDP. Non-IG is a dummy that equals one if the borrowing firm's S&P rating is BB+ or worse, and zero otherwise. Size is measured as the logarithm of total value of assets in millions of dollars, Age is number of years since the firm's first entry in Compustat, ROA is calculated as operating income scaled by total assets, Leverage is total debt scaled by total assets, and Tangibility is net plant, property and equipment scaled by total assets.

Panel A. DealScan Data

	Mean	Standard Deviation	25th Percentile	Median	75th Percentile	Observations
Spread (bps)	284.80	160.35	175.00	255.00	355.00	50,614
Secured	0.85	0.36	1.00	1.00	1.00	50,614
Senior	1.00	0.03	1.00	1.00	1.00	50,614
Maturity (years)	3.91	0.53	3.61	4.09	4.28	50,614
Amount (log dollar value)	18.42	1.65	17.27	18.52	19.58	50,614
Covenant	0.53	0.50	0.00	1.00	1.00	50,614
Secured × Baa–Aaa spread	1.93	1.01	1.59	2.01	2.64	50,614
Secured × GDP growth	0.56	0.55	0.13	0.58	0.89	50,614
Baa–Aaa spread (%)	2.29	0.65	1.71	2.20	2.75	50,614
GDP growth (%)	0.66	0.54	0.43	0.71	0.93	50,614

Panel B. Mergent Data

	Mean	Standard Deviation	25th Percentile	Median	75th Percentile	Observations
Spread (bps)	208.32	207.11	66.26	124.47	287.95	30,041
Secured	0.15	0.36	0.00	0.00	0.00	30,041
Senior	0.91	0.29	1.00	1.00	1.00	30,041
Maturity (years)	11.01	7.96	6.00	10.00	10.00	30,041
Callable	0.67	0.47	0.00	1.00	1.00	30,041
Amount (log dollar value)	11.34	2.34	10.13	12.10	12.90	30,041
Covenant	0.40	0.49	0.00	0.00	1.00	30,041
Secured × Baa–Aaa spread	0.34	0.86	0.00	0.00	0.00	30,041
Secured × GDP growth	0.11	0.33	0.00	0.00	0.00	30,041
Senior × Baa–Aaa spread	2.12	0.95	1.67	2.12	2.72	30,041
Senior × GDP growth	0.61	0.55	0.27	0.63	0.95	30,041
Baa–Aaa spread (%)	2.30	0.70	1.73	2.18	2.77	30,041
GDP growth (%)	0.69	0.54	0.45	0.74	0.99	30,041
Non-IG	0.24	0.43	0.00	0.00	1.00	22,541
Secured × Non-IG	0.04	0.20	0.00	0.00	0.00	22,541

Panel C: TRACE Data

	Mean	Standard Deviation	25th Percentile	Median	75th Percentile	Observations
Spread (bps)	211.99	206.05	84.04	141.81	257.72	3,675,393
Secured	0.08	0.28	0.00	0.00	0.00	3,675,393
Senior	0.99	0.11	1.00	1.00	1.00	3,675,393
Maturity (years)	8.92	8.27	3.00	6.00	10.00	3,675,393
Callable	0.93	0.26	1.00	1.00	1.00	3,675,393
Amount (log dollar value)	13.35	0.73	12.90	13.30	13.82	3,675,393
Covenant	0.90	0.30	1.00	1.00	1.00	3,675,393
Non-IG	0.21	0.41	0.00	0.00	0.00	2,777,603
Secured × Non-IG	0.04	0.19	0.00	0.00	0.00	2,777,603
Size (log $ mil.)	10.34	1.22	9.55	10.40	11.16	2,466,484
Age (years)	40.27	19.24	23.50	41.50	58.50	2,466,484
Leverage	0.34	0.15	0.23	0.31	0.43	2,466,484
ROA (%)	14.15	6.54	9.76	13.45	17.56	2,384,090
Tangibility (%)	34.88	25.25	12.04	29.35	56.05	2,463,537

Table II

Secured Spread Using DealScan Loan Sample

This table reports the results of OLS regressions relating loan spreads to the presence of secured interest in the loan over the 1994 to 2018 time period. The dependent variable is the spread over LIBOR paid at issuance of a loan facility. Secured is a dummy that takes the value of one if a loan facility is secured, and zero otherwise. The regressions also control for seniority, maturity, issuance amount, and the presence of a covenant. Column (4) uses package fixed effects and hence absorbs all variations across packages. All regressions are estimated with heteroscedasticity robust standard errors that are clustered by firm, and t-statistics are reported below the coefficients in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

	(1)	(2)	(3)	(4)
Secured	100.764***	57.892***	-40.556***	-72.239***
	(41.44)	(18.14)	(-4.31)	(-4.44)
Senior	-201.672***	-194.091***	-198.106***	-150.266***
	(-7.21)	(-6.74)	(-7.22)	(-3.19)
Maturity	-4.748**	-3.232	25.662***	36.182***
	(-2.40)	(-1.55)	(11.34)	(8.74)
Amount	-26.231***	-15.121***	-10.206***	-10.441***
	(-35.34)	(-19.28)	(-12.48)	(-11.99)
Covenant	-38.103***	-24.894***	-15.544***	
	(-18.80)	(-10.83)	(-2.87)	
Fixed Effects	year × month, facility type	year × month, firm, facility type	year × month, firm × year, facility type	Package, facility type
Observations	50,614	48,187	34,700	30,905
Adj. R-squared	0.469	0.628	0.671	0.689

Table III

Secured Spread Using Mergent FISD Bond Sample

This table reports the results of OLS regressions relating bond spreads at issuance to presence of secured interest in the bond over the 1980 to 2018 time period. The dependent variable is the yield difference at issuance between a bond and a maturity-matched treasury. Secured is a dummy that takes the value of one if a bond is secured, and zero otherwise. The regressions also control for seniority status, maturity, callability, issuance amount, and the presence of a covenant in the bond contract. All regressions are estimated with heteroscedasticity robust standard errors that are clustered by firm, and t-statistics are reported below the coefficients in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

	(1)	(2)	(3)
Secured	59.969***	55.885***	-35.194***
	(7.24)	(8.21)	(-3.81)
Senior	-104.477***	-37.680***	-43.965***
	(-7.52)	(-4.38)	(-4.31)
Maturity	-4.278***	1.005***	1.993***
	(-16.16)	(10.14)	(22.66)
Callable	79.413***	12.083***	11.184
	(10.21)	(2.76)	(1.31)
Amount	1.535	2.373***	2.262***
	(0.78)	(3.48)	(3.40)
Covenant	-133.949***	-23.252***	-3.412
	(-24.63)	(-6.75)	(-0.70)
Fixed Effects	year × month	year × month, firm	year × month, firm × year
Observations	30,041	27,229	19,187
Adj. R-squared	0.400	0.828	0.940

Table IV

Secured Spread Using TRACE Trading Data

This table reports the results of OLS regressions relating bond yields to the presence of secured interest in the bond over the 1980 to 2018 time period. The dependent variable is the difference between the implied yield from secondary trade prices and maturity-matched treasury. Secured is a dummy that takes the value of one if a bond is secured, and zero otherwise. The regressions also control for seniority status, maturity, callability, issuance amount, and the presence of a covenant in the bond contract. All regressions are estimated with heteroscedasticity robust standard errors that are clustered by firm, and t-statistics are reported below the coefficients in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

	(1)	(2)	(3)
Secured	91.415***	-45.156*	-62.583***
	(4.64)	(-1.76)	(-2.66)
Senior	-182.815***	-55.520***	-60.505***
	(-9.40)	(-3.50)	(-3.68)
Maturity	-2.151***	2.386***	2.990***
	(-5.68)	(20.78)	(33.45)
Callable	-21.607	-8.606	11.590***
	(-1.24)	(-1.60)	(2.89)
Amount	-33.802***	-2.596	0.907
	(-6.14)	(-0.86)	(0.58)
Covenant	9.904	4.229	2.525
	(0.93)	(0.93)	(0.88)
FE	year × month	firm, year × month	firm × year × month
Observations	3,675,393	3,675,328	3,658,889
Adj. R-squared	0.173	0.727	0.952

Table V

Secured Spread and Firm Characteristics

This table reports the results of OLS regressions relating the spread gap between unsecured and secured bonds to firm characteristics. The dependent variable is a measure of spread over maturity-matched treasury. Secured is a dummy that takes the value of one if a bond is secured, and zero otherwise. Senior is a dummy that takes the value of one if a bond is senior, and zero otherwise. Size is logarithm of total value of assets in millions of dollars, Age is number of years since the firm's first entry in Compustat, ROA is calculated as operating income scaled by total assets, Leverage is total debt scaled by total assets, and Tangibility is net plant, property, and equipment scaled by total assets. Firm characteristics are measured at the end of the quarter before bond trades. The regressions also control for maturity, callability, issuance amount, and the presence of a covenant in the bond contract. All regressions are estimated with heteroscedasticity robust standard errors that are clustered by firm, and t-statistics are reported below the coefficients in parentheses. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

	(1)	(2)	(3)	(4)	(5)	(6)
Secured	-554.108*	-115.967	-236.088**	115.898***	-260.517***	-378.569***
	(-1.77)	(-1.21)	(-2.29)	(3.35)	(-2.98)	(-2.60)
Secured × Size	41.810					40.882***
	(1.28)					(2.61)
Secured × Age		-0.851				-7.188***
		(-0.35)				(-3.22)
Secured × ROA			7.967			9.882*
			(1.25)			(1.90)
Secured × Leverage				-478.494***		-288.485***
				(-8.99)		(-3.82)
Secured × Tangibility					3.022*	5.411***
					(1.66)	(4.45)
Senior	-42.429***	-47.700***	-46.930***	-39.743***	-42.051***	-41.980***
	(-2.89)	(-3.16)	(-2.87)	(-2.74)	(-3.00)	(-2.70)
FE	firm × year × month	firm × year × month	firm × year × month	firm × year × month	firm × year × month	firm × year × month
Controls for bond characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,460,744	2,460,744	2,378,655	2,460,744	2,457,806	2,376,191
Adj. R-squared	0.948	0.948	0.948	0.948	0.948	0.949

Table VI

Secured Spread and Firm Quality

This table reports the results of OLS regressions relating spreads on debt securities to the presence of secured interest in the debt for investment grade and non-investment grade firms separately. Columns (1) and (2) use Mergent bond issuance data, whereas columns (3) and (4) use TRACE bond trading data. The dependent variable is a measure of spread over maturity-matched treasury. Secured is a dummy that takes the value of one if a bond is secured, and zero otherwise. Non-IG firms have an S&P rating of BB+ or worse. The regressions also control for seniority status, maturity, callability, issuance amount, and the presence of a covenant in the bond contract. All regressions are estimated with heteroscedasticity robust standard errors that are clustered by firm, and t-statistics are reported below the coefficients in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

	Mergent		Trace	
	IG	Non-IG	IG	Non-IG
	(1)	(2)	(3)	(4)
Secured	-1.587	-55.280**	-2.618	-128.921***
	(-0.33)	(-2.08)	(-0.46)	(-3.73)
Senior	-22.353	-46.284**	-12.514*	-63.141**
	(-1.49)	(-2.45)	(-1.65)	(-2.22)
Maturity	2.023***	2.755***	2.862***	4.621***
	(33.78)	(3.41)	(38.73)	(5.36)
Callable	-0.012	33.041***	-6.969***	26.889
	(-0.01)	(4.44)	(-4.15)	(1.63)
Amount	2.021***	4.709	0.570	0.304
	(3.43)	(1.48)	(0.69)	(0.05)
Covenant	-5.728	0.998	-1.072	30.120*
	(-1.30)	(0.04)	(-0.84)	(1.70)
FE	year × month, firm × year	year × month, firm × year	firm × year × month	firm × year × month
Observations	13,455	2,408	2,194,123	573,308
Adj. R-squared	0.901	0.942	0.924	0.921

Table VII

Cyclicality in Secured Issuance and Secured Spread

This table reports results from the analysis of cyclicality in secured bond issuance (Panel A) and secured spread (Panel B) using data from Mergent for the 1980 to 2018 time period. The dependent variable in columns (1) and (2) of Panel A is a dummy that takes the value of one if the bond issued is secured, and zero otherwise. The dependent variable in columns (3) and (4) is the dollar share of secured bond in total monthly bond issuance. Baa-Aaa spread is the difference between Moody's Seasoned Corporate Bond Yield on Baa and Aaa rated bonds, while GDP growth is calculated as the quarterly growth rate in real GDP. Non-IG firms have an S&P rating of BB+ or worse. Regressions in columns (1) and (2) are estimated with heteroscedasticity robust standard errors that are clustered by year × month and firm. The dependent variable in Panel B is the yield difference at issuance between a bond and a maturity-matched treasury. Secured is a dummy that takes the value of one if a bond is secured, and zero otherwise. The regressions also control for seniority status, maturity, callability, issuance amount, and the presence of a covenant in the bond contract. The regressions are estimated with heteroscedasticity robust standard errors that are clustered by firm, and t-statistics are reported below the coefficients in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Panel A. Secured Issuance

	Secured Bond Dummy		$ Share of Secured Issuance	
	(1)	(2)	(3)	(4)
Baa-Aaa spread (%)	-0.018		-0.007	
	(-1.12)		(-0.29)	
Non-IG × BaaAaa spread (%)	0.148***		0.093***	
	(5.44)		(2.84)	
GDP growth		-0.043		0.258
		(-0.36)		(0.31)
Non-IG × GDP growth		-3.678***		-3.867***
		(-4.13)		(-3.33)
Non-IG			0.090***	0.199***
			(2.66)	(14.04)
Fixed Effects	rating, firm	rating, firm	-	-
Observations	25,556	25,556	706	706
Adj. R-squared	0.759	0.760	0.225	0.231

Panel B. Secured Spread

	(1)	(2)
Secured	8.799	-42.473***
	(0.44)	(-4.14)
Secured × Baa–Aaa spread	-18.519**	
	(-2.03)	
Secured × GDP growth		10.320**
		(2.21)
Senior	-48.037	-58.928***
	(-1.49)	(-4.59)
Senior × Baa–Aaa spread	1.639	
	(0.11)	
Senior × GDP growth		19.014***
		(3.01)
Maturity	1.991***	1.990***
	(22.64)	(22.80)
Callable	11.182	11.342
	(1.31)	(1.33)
Amount	2.273***	2.269***
	(3.42)	(3.41)
Covenant	-3.362	-3.632
	(-0.70)	(-0.75)
FE	year × month, firm × year	year × month, firm × year
Observations	19,187	19,218
Adj. R-squared	0.940	0.940

Table VIII

Secured Issuance and Secured Spread

This table reports the results of OLS regressions relating the choice of secured vs unsecured bond issuance to estimated secured spread during the 2003 to 2020 time period. The dependent variable is a dummy that takes the value of one if the bond issued is secured, and zero otherwise. Secured spread is estimated by running regression Eq. (1) at the monthly frequency using TRACE bond trading data. Baa-Aaa spread is the difference between Moody's Seasoned Corporate Bond Yield on Baa and Aaa rated bonds, while GDP growth is calculated as the quarterly growth rate in real GDP. Lending tightness is a measure of tightening standards for commercial and industrial loans to large and middle-market firms obtained from the Senior Loan Officer Opinion Survey. Panel A presents results for the non-investment grade sample whereas Panel B presents results for the investment grade sample. All regressions are estimated with heteroscedasticity robust standard errors that are clustered by year × month and firm, and t-statistics are reported below the coefficients in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Panel A. Non-IG Sample

	Non-IG Sample				
	(1)	(2)	(3)	(4)	(5)
Secured spread (%)	0.043***	0.043***	0.032***	0.035***	0.038***
	(3.28)	(3.36)	(2.70)	(2.88)	(2.96)
Baa-Aaa spread (%)			0.095***		
			(4.98)		
Lending tightness				0.201***	
				(3.74)	
GDP growth					-2.792***
					(-3.33)
Fixed Effects	firm	rating, firm	rating, firm	rating, firm	rating, firm
Observations	5,640	5,640	5,640	5,640	5,640
Adj. R-squared	0.598	0.606	0.611	0.612	0.612

Panel B. IG Sample

	IG Sample				
	(1)	(2)	(3)	(4)	(5)
Secured spread (%)	0.010	0.012	0.009	0.014	0.016
	(0.81)	(0.94)	(0.70)	(1.07)	(1.21)
BaaAaa spread (%)			0.005		
			(1.51)		
Lending tightness				0.010	
				(1.41)	
GDP growth					-0.187
					(-1.37)
Fixed Effects	firm	rating, firm	rating, firm	rating, firm	rating, firm
Observations	10,039	10,039	10,039	10,039	10,039
Adj. R-squared	0.891	0.891	0.891	0.891	0.891

<u>Appendix A</u>

Table A.1

Secured Spread Using Mergent FISD Bond Sample: Robustness (year × qtr)

This table reports the results of OLS regressions relating bond spreads to the presence of secured interest in the bond over the 1980 to 2018 time period. The dependent variable is the yield difference at issuance between a bond and maturity-matched treasury. Secured is a dummy that takes the value of one if a bond is secured, and zero otherwise. The regressions also control for seniority status, maturity, callability, issuance amount, and the presence of a covenant in the bond contract. All regressions are estimated with heteroscedasticity robust standard errors that are clustered by firm, and t-statistics are reported below the coefficients in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

	(1)	(2)	(3)
Secured	59.969***	55.885***	-48.664***
	(7.24)	(8.21)	(-3.53)
Senior	-104.477***	-37.680***	-65.986***
	(-7.52)	(-4.38)	(-4.97)
Maturity	-4.278***	1.005***	2.137***
	(-16.16)	(10.14)	(21.86)
Callable	79.413***	12.083***	13.556
	(10.21)	(2.76)	(1.32)
Amount	1.535	2.373***	2.123***
	(0.78)	(3.48)	(3.57)
Covenant	-133.949***	-23.252***	-8.210
	(-24.63)	(-6.75)	(-1.36)
Fixed Effects	year × month	year × month, firm	year × month, firm × year × qtr
Observations	30,041	27,229	16,087
Adj. R-squared	0.400	0.828	0.953

Appendix B

To show $Secured\ Spread = p(LGD_{Unsecured} - LGD_{Secured})$

Let us assume a firm's one year probability of default is constant over time at *p* and the common discount rate for the firm's corporate bonds is *r*. Let us assume the firm has a secured and an unsecured bond outstanding, both with maturity *n* years from now, and the yield to maturity on the bonds are r^S and r^U respectively. Assuming that default, if it occurs, happens at the end of the year, let the loss given default per unit of principal and interest due be L^S and L^U respectively. Then we know that for the unsecured bond

$$1 = \frac{p(1+r^U)(1-L^U)}{(1+r)} + \frac{(1-p)}{1+r}\left[r^U + \frac{p(1+r^U)(1-L^U)}{(1+r)} + \frac{(1-p)}{1+r}\left[r^U + \ldots for\ n\ periods\right]\right]$$

A similar expression can be written for the secured bond. Subtracting it on both sides from the expression for the unsecured bond, we get

$$\begin{aligned}
0 &= \frac{p}{1+r}\left[\underbrace{(1+r^U)(1-L^U) - (1+r^S)(1-L^S)}_{X}\right] \\
&+ \frac{1-p}{1+r}\left[(r^U - r^S) + \frac{p}{1+r}[X]\right] \\
&+ \frac{(1-p)^2}{(1+r)^2}\left[(r^U - r^S) + \frac{p}{1+r}[X]\right] \\
&+ \ldots \\
&+ \frac{(1-p)^n}{(1+r)^n}\left[(r^U - r^S)\right]
\end{aligned}$$

Collecting terms, we have

$$0 = \frac{p}{1+r}\left[1 + \frac{1-p}{1-r} + \ldots + \frac{(1-p)^{n-1}}{(1+r)^{n-1}}\right]X + \frac{1-p}{1+r}\left[1 + \frac{1-p}{1-r} + \ldots + \frac{(1-p)^{n-1}}{(1+r)^{n-1}}\right](r^U - r^S)$$

So $pX + (1-p)(r^U - r^S) = 0$. Substituting for *X* from above and simplifying, we get $r^U - r^S = p\left[(1+r^U)L^U - (1+r^S)L^S\right]$ where the term on the lhs is the secured spread while the term in square brackets on the rhs is simply the difference in the loss given default between the two bonds.