

## **The Impact of Information Asymmetry on Debt Pricing and Maturity\***

Regina Wittenberg Moerman<sup>§</sup>

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### Abstract

In this paper, I exploit a syndicated loan market to explore the impact of information asymmetry on debt pricing and maturity. As a measure of information asymmetry associated with a borrowing firm, I utilize the bid-ask spread on the firm's loans traded on the secondary loan market. There are two primary findings. First, I find that, *ceteris paribus*, the interest rate spread on a borrower's syndicated loan is positively related to the average bid-ask spread on its previous loans traded on the secondary loan market. Second, I show, *ceteris paribus*, a negative relation between the syndicated loan's maturity and the average bid-ask spreads on the borrower's traded loans. This empirical evidence demonstrates that information asymmetry increases the cost of debt capital and reduces the debt maturity.

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<sup>§</sup>Graduate School of Business, University of Chicago, 5807 S. Woodlawn Ave., Chicago, IL 60637; email: [rwittenb@ChicagoGSB.edu](mailto:rwittenb@ChicagoGSB.edu)

## **1. Introduction**

In this paper, I examine the impact of information asymmetry on debt pricing and maturity. The role of information asymmetry in debt contracting has long been of interest to researchers in accounting and finance. By investigating how information asymmetry influences debt contractual terms in the syndicated loan market, this paper demonstrates that information asymmetry increases the cost of debt capital and reduces the debt maturity.

The syndicated loan market is a promising setting to test the role of information asymmetry in debt contracting, because it includes both the primary loan market, where syndicated loans are originated and an active secondary market, where syndicated loans are traded after the close of primary syndication. Loan trading data offers a methodological advantage in evaluating a borrower's information opacity: I utilize the bid-ask spread in the secondary loan trade as a measure of information asymmetry associated with a borrowing firm. Following Copeland and Galai (1983), Glosten and Milgrom (1985) and Kyle (1985), many papers rely on the bid-ask spread as the main measure of information asymmetry.<sup>1</sup>

The empirical evidence presented in this paper demonstrates that the cost and maturity of a borrower's syndicated loan financing is determined to a large extent by information asymmetry, as measured by the bid-ask spreads on the borrower's loans traded on the secondary loan market. Specifically, I find that, *ceteris paribus*, the interest rate spread on a borrower's syndicated loan is positively related to the average bid-ask spread on its previous loans traded on the secondary loan market.<sup>2</sup> I also show, *ceteris paribus*, a negative relation between the syndicated loan's maturity and the average bid-ask spreads on the borrower's traded loans.

The emphasis on the syndicated loan market as a means of investigating information asymmetry is especially intriguing because it points to two potential interpretations of the

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<sup>1</sup> See, for example, Lee et al. (1993), Yohn (1998), Leuz and Verrecchia (2000), Kalimipalli and Warga (2002), Roulstone (2003), Ertimur (2004) and Sadka and Sadka (2004).

<sup>2</sup> The bid-ask spread on a borrower's previous loans is estimated over a twelve-month period prior to the new syndicated loan's issuance.

significant relation between the bid-ask spread and the loan contractual terms. First, because the bid-ask spread explicitly measures information asymmetry, when incorporated into an empirical analysis, this variable serves as a proxy for the syndicate lenders' uncertainty regarding a borrower.<sup>3</sup> Second, the bid-ask spread in the secondary loan trade may also provide some new and valuable information otherwise not available to the lenders. The bid-ask spread reflects the secondary traders' assessment of the characteristics of a borrower's information environment, and lenders at the primary loan market may rely on this estimation in loan pricing and in shaping the loan maturity structure. Stated differently, the bid-ask spread not only proxies for the lenders' perception of a borrower's information opacity, but it also reflects some additional attributes of the borrower's information structure, which are not observable to the lenders from sources other than secondary loan trading. While the two interpretations underscore different aspects of information asymmetry regarding a borrower, they both strongly support the important impact of information asymmetry on debt pricing and maturity.

The first contribution of this paper is that it specifically explores how information asymmetry affects the pricing and maturity of private debt contracts. Despite the apparent importance of private lending as a funding source for U.S. firms, the relation between information asymmetry and private debt contractual terms remains largely unexplored.<sup>4</sup> The syndicated loan market proves to be an excellent empirical setting in which to examine this relation because it involves an exceptionally wide range of private debt contracts, a range that includes loans issued to public and private firms, as well as investment grade and leveraged (high yield) private debt issues. To the best of my knowledge, this paper is the first that explicitly examines the impact of information asymmetry on the interest rate spread and maturity of the private corporate debt

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<sup>3</sup> This interpretation relies on the plausible assumption that the information set of the syndicate lenders is positively correlated with the information set of the secondary loan market participants.

<sup>4</sup> The exceptions include Berger et al. (2005) and Ortiz-Molina and Penas (2005), who examine debt maturity choices in small business lending. The related research also includes Bharath et al. (2004b), who examine the impact of accruals quality on the cost of debt and debt maturity, and Asquith et al. (2005), who link the interest rate spread to the performance pricing option embedded in loan contracts. Bharath et al. (2004b) restrict their analysis to loans of public borrowers only.

contracts. This paper is also the first to explore how information asymmetry affects the cost of capital and the debt maturity structure of private firms.

My study is closely related to prior research which demonstrates that investors demand an extra return to induce them to hold assets with a high information risk. Amihud and Mendelson (1986)<sup>5</sup>, Easley et al. (2002) and Easley and O'Hara (2004) show that investors demand a higher return to hold stocks subject to higher information asymmetry. Unless public information is perfect, such information risk is a nondiversifiable risk factor. Lambert et al. (2005) demonstrate that differences in information quality across firms survive the forces of diversification, even in a capital market with perfect competition and with information quality uncorrelated across firms.

Despite the fact that prior research supports the proposition that the information structure of a firm plays an important role in determining its cost of capital, this proposition is difficult to explore because the extent of information asymmetry is not directly observable. Prior empirical studies which examine the impact of information asymmetry on debt pricing rely on the following measures of information asymmetry: analyst ratings of the firm's disclosure policy (Sengupta, 1998, and Yu, 2005)<sup>6</sup>, discretionary accruals (Francis et al., 2005, and Bharath et al., 2004b), and analyst coverage and forecast dispersion (Mansi et al., 2005). While these measures address different attributes of the firm's information environment, they do not provide an overall evaluation of the amount and quality of information available regarding a borrower. By exploiting the loan bid-ask spread to explicitly measure the information asymmetry regarding a borrower, this paper contributes to existing research by documenting that information asymmetry is priced in the cost of debt capital.

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<sup>5</sup> Amihud and Mendelson (1986) demonstrate that higher bid-ask spread stocks yield higher expected returns. There is a principal difference between the Amihud and Mendelson's (1986) approach and the approach suggested in this paper: while Amihud and Mendelson (1986) relate returns and the bid-ask spreads on the same portfolios, in this paper, I use the bid-ask spread on the other loan securities of the borrower to explain a loan's interest rate. Thus, the information asymmetry measure employed in my analysis captures not only information costs in secondary loan trading, but also more fundamental characteristics of the borrowing firm's information environment.

<sup>6</sup> The high quality of a firm's disclosure also decreases the cost of equity capital (Botosan, 1997, Healy, Hutton and Palepu, 1999, Brown et al., 2001, and Botosan and Plumlee, 2002).

This paper also contributes to the literature that examines the influence of asymmetric information on debt maturity. Previous studies employ the following measures of information asymmetry: growth options, measured by the ratio of a borrower's R&D intensity and market-to-book ratio, size and age of a firm, discretionary accrual estimates, and variables, reflecting a borrower's favorable *ex ante* private information, such as *ex post* changes in earnings and stock returns.<sup>7</sup> Because these variables are likely to be noisy measures of information asymmetry, many studies find relatively weak results in the application of these variables in the maturity estimations. The application of the loan bid-ask spread as an overall information asymmetry measure provides much stronger support for the significant relation between debt maturity and the information opacity of a borrower.

Exploring the impact of information asymmetry on debt maturity in the setting of the syndicated loan market has an additional methodological advantage. Syndicated loans permit an incremental approach to maturity estimation, which focuses on the maturity of new debt issues, as opposed to the balance sheet approach, which examines the maturity structure of a borrower's overall outstanding debt. Because characteristics of a borrowing firm's information environment may vary significantly over time, the incremental approach provides a better empirical specification to test the relation between information asymmetry and debt maturity.<sup>8</sup>

The analysis presented in this paper also widens our understanding of the role of information asymmetry in the syndicated loan market. Previous literature has focused mainly on investigating of the impact of information asymmetry on the syndicate structure and the prospects of a loan to be syndicated.<sup>9</sup> A number of studies suggest that loans to information-opaque borrowers are characterized by a more concentrated syndicate and by a larger portion of a loan

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<sup>7</sup> See, for example, Barclay and Smith (1995), Guedes and Opler (1996), Stohs and Mauer (1996), Scherr and Hulbert (2001), Barclay et al. (2003), Johnson (2003), Bharath et al. (2004b) and Ortiz-Molina and Penas (2005). Berger et al. (2005), who examine small business lending, employ the existence of small business credit scoring technology to measure information asymmetry.

<sup>8</sup> An additional benefit of the incremental approach is that it relies on a precise measure of an issue's maturity. In contrast, the balance sheet approach employs proxies to a borrower's debt maturity structure.

<sup>9</sup> The exceptions include Bharath et al. (2004b), Harjoto et al. (2004) and Asquith et al. (2005).

retained by the arranger (Simons, 1993, Dennis and Mullineaux, 2000, Lee and Mullineaux, 2004, and Sufi, 2005). In addition, the arranger is less likely to syndicate a loan when information about the borrower is less transparent (Dennis and Mullineaux, 2000). Because these findings imply that syndicate lenders emphasize the importance of a borrower's information environment, it is only natural to pose the question of how information asymmetry affects the loan contractual terms. The empirical evidence confirms that information asymmetry associated with a borrowing firm increases the cost of syndicated loan financing and decreases the syndicated loan maturity.

The extensive analysis of information asymmetry presented in this paper helps to explain how the syndicated loan market operates. More specifically, by exploring how the trading spreads from the secondary loan market translate into the pricing and maturity of subsequent syndicated loan issues, this paper contributes to our understanding of the interaction between the primary and the secondary loan markets. To the best of my knowledge, this paper is the first to examine the information channels between these two loan markets.

The following section provides a brief description of the syndicated loan market. The third section describes the data and control variables. The fourth section discusses empirical findings. The fifth section focuses on the alternative explanations. The sixth section presents conclusions and avenues for future research.

## **2. The syndicated loan market: Background and development**

The U.S. syndicated loan market bridges the private and public debt markets and provides borrowers with an alternative source of financing to high yield bonds and relationship-based bilateral bank loans. A syndicated loan is a private debt instrument that also has the features of a public debt security, such as credit ratings and an active secondary market. A syndicated loan is provided by a group of lenders and it is structured, arranged, and managed by one or several commercial or investment banks known as arrangers (Standard & Poor's, 2003).

While each of the syndicate lenders is responsible only for a portion of the total loan, the syndicated loan is governed by a common loan contract. The terms of the syndicated loan are identical for all the members of syndication; the participants' unanimity is required to change the principal terms of the loan contract, such as the amount, interest rate spread, maturity, repayment schedule and collateral. The arranger who manages the loan syndication negotiates the loan agreement, coordinates the documentation process and the loan closing, recruits loan participants, arranges administration of repayments and performs primarily monitoring and enforcement responsibilities (Dennis and Mullineaux, 2000, Panyagometh and Roberts, 2002, and Lee and Mullineaux, 2004). The arranger also usually retains the largest share of the syndicated loan.

Syndicated loans are floating rate debt issues, priced at a specified interest rate spread above a reference rate; the most frequently used pricing options include Prime, LIBOR and Certificate of Deposit. Syndicated loans are always senior debt instruments. Another distinct feature of syndicated loans is the inclusion of extensive financial covenant restrictions in the loan agreement. These covenants are typically calculated quarterly and provide syndicate lenders with considerable control over a borrower's actions (Assender, 2000). As private debt instruments, syndicated loans contain more numerous and stricter covenants than public debt issues (Smith and Warner, 1979, Dichev et al., 2002, and Dichev and Skinner, 2002).

After the close of primary syndication, syndicated debt instruments can be traded on the secondary loan market. Loan sales are structured either as assignments or participations, with investors usually trading through loan trading desks at large underwriting banks. When interest in the loan is being transferred by assignment, the buyer becomes a direct signatory to the loan. In participation, the original lender remains the holder of the loan and the buyer is taking a participating interest in the existing lender's commitment (Standard & Poor's, 2003). The loan sale via assignments usually requires the consent of the borrower and the arranger of the syndication for the loan sale. In a sale via participations such consents are almost never required. The majority of loan sales in the secondary loan market are performed via assignment.

The primary and the secondary loan markets have grown rapidly in recent years. The value of syndicated loans outstanding increased from \$291 billion in 1991 to \$1,600 billion in 2003; starting in 1999, U.S. firms have obtained over \$1 trillion in new syndicated loans each year. The secondary loan market expanded even faster than the primary market, with trading of syndicated loans growing at compound annual rate of 27 percent per year. From a trading volume of \$8 billion in 1991, the secondary loan market has increased to a trading volume of \$144.6 billion in 2003. Leveraged loans<sup>10</sup> constitute the fastest growing part of both loan markets. Since 2001, leveraged loans have represented 35 percent of syndicated loan issuances and 80 percent of the total value of par loan trades<sup>11</sup> (Gold Sheets, Loan Pricing Corporation).

### **3. Data and research design**

#### **3.1 Data sources and sample selection**

The empirical tests are based on data obtained from the Loan Trade Database and the DealScan database, which are provided by the Loan Pricing Corporation (LPC). The Loan Trade Database includes indicative loan bid and ask price quotes on syndicated loans traded on the secondary loan market. The price quotes are reported to LPC by trading desks at institutions that make a market in these loans.<sup>12,13</sup> In addition to price coverage, for every traded loan (facility)<sup>14</sup> the database provides the borrower's name, the quote date, and the number of market makers

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<sup>10</sup> LPC defines leveraged loans as loans rated below BBB- or Baa3 or unrated and priced at the spread equal, or higher than 150 bps above LIBOR.

<sup>11</sup> Loans traded above 90 percent of their par value.

<sup>12</sup> Institutions providing bid and ask prices currently include but are not limited to: Bank of Montreal, The Bank of New York, Bank of Nova Scotia, BANK ONE, Bank of America Securities LLC, BankBoston, BT Alex Brown/Deutsche Bank AG, The Chase Manhattan Bank, NA, CIBC World Markets, Citibank, NA, Credit Lyonnais, Credit Suisse First Boston Corporation, DLJ Capital Funding, INC., First Union Capital Markets Corp., Goldman, Sachs & Company, J.P. Morgan Securities, Inc., Lehman Brothers, Inc., Merrill Lynch, Pierce Fenner & Smith Incorporated, Morgan Stanley Dean Witter and TD Securities (USA) Inc.

<sup>13</sup> The Loan Trade Database provides bid and ask price quotes aggregated across market makers. Bid and ask prices are quoted as a percent of par (or cents on the dollar of par value).

<sup>14</sup> "Facility" designates a loan in the syndicated loan market. Usually, a number of facilities with different maturities, interest rate spreads and repayment schedules are structured and syndicated as one transaction (deal) with a borrower. The analysis in this paper is performed at the individual facility level.

reporting indicative price quotes to LPC. According to LPC estimates, the Loan Trade Database covers 80% of the trading volume of the secondary loan market in the U.S. The Loan Trade Database incorporates 2,125,589 trading observations for the period from June 1998 to December 2003, which represent the trading history of about 4,788 syndicated loans.<sup>15</sup>

I subsequently match the Loan Trade Database to the DealScan database; connecting these two databases allows me to identify borrowers from the Loan Trade Database on the primary loan market. The DealScan database covers a majority of the syndicated loan issues in the U.S. and provides a wide range of loan characteristics, such as interest rate spread, amount, maturity, seniority, securitization, the covenant package and the identity of the lenders. By connecting the two databases, it is possible to identify 3,611 traded facilities representing 1,435 borrowing firms (Table 1).<sup>16</sup> From this sample I drop loans which lack sufficient secondary pricing data<sup>17</sup> and loans issued to non-U.S. firms or in currencies other than U.S. Dollar. The remaining sample contains 1,418 borrowing firms with 3,417 syndicated loans traded on the secondary market.

Furthermore, constructing an information asymmetry measure requires a borrower to have traded loans prior to the issue of a new syndicated facility. I estimate the information asymmetry variable as an average bid-ask spread on a borrower's loans traded on the secondary loan market over the twelve month period prior to a new syndicated issuance.<sup>18</sup> This requirement restricts the

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<sup>15</sup> The database coverage is limited in 1998, but it increases sharply in 1999. Since 1999, the annual rate of increase in the number of the traded facilities covered by the database has been consistent with the increase in the secondary loan market trading volume.

<sup>16</sup> I merge the Loan Trade Database and the DealScan database by the Facility-ID and/or Loan Identification Number (LIN). Facility-ID is a number assigned by LPC to each syndicated facility on the primary loan market. LIN is assigned to each syndicated facility that is traded on the secondary loan market or has been considered for trading. According to LPC, observations missing Facility-ID and LIN identifiers on the Loan Trade Database belong to the period when LPC just started covering the secondary loan market. In addition, LINs with less than 13 digits can not be matched with the DealScan database. LINs with less than 13 digits are assigned to the trading facilities in the following circumstances: a) the traded loan is private and is not covered by DealScan; b) the traded loan is a "prorate piece" - a combination of two different facilities; since these two facilities are traded as one piece, but were originated as independent facilities in the primary loan market, prorated pieces can not be directly connected to the DealScan database.

<sup>17</sup> 47 traded loans related to 17 borrowing firms are missing either bid or ask price quotes; this precludes an estimation of the bid-ask spread for these traded facilities.

<sup>18</sup> More specifically, I estimate the bid-ask spread on a borrower's loans over the twelve month period preceding the month of a new syndicated loan issue. If the borrower's loans continue to be traded during

analysis to 808 U.S. borrowers who have been issued additional syndicated loans during the year following the secondary trading of their previous syndicated facilities. This leads to a sample of 2,966 syndicated loans which contractual term may be linked to the information asymmetry measure based on the secondary loan trading. Finally, to perform a regression analysis, I also exclude loans which do not have data available on the interest rate spread, the facility size and the loan maturity. The final sample results in 2,486 syndicated loans representing 749 borrowers.

To enrich the information set regarding the borrowing firms, I match the sample borrowers with CRSP and COMPUSTAT databases. The DealScan database uses the Ticker identifier to classify publicly reporting firms. However, the coverage of the Ticker data is only partial: many publicly reporting firms are missing Tickers or have been assigned outdated Tickers. By using the Tickers available on DealScan, I can identify 298 of the borrowers as publicly reporting and publicly traded firms.<sup>19</sup> To improve the identification, the rest of the sample borrowing firms have been matched with COMPUSTAT / CRSP by name, industry affiliation and state location; these data parameters are available on the DealScan database for every borrower.<sup>20</sup> This procedure results in the recognition of an additional 168 borrowers as firms publicly reporting to the SEC, 81 of which are also publicly traded on the U.S. stock exchanges.<sup>21</sup>

### **3.2 Control variables: empirical determinants of the interest rate spread**

To insure that the significant relation between loan pricing and trading spreads is not driven by other loan attributes, I use a variety of control variables. First, I incorporate loan- and firm-specific characteristics that, according to previous research, are related to debt pricing. Second, to

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the issue month and there are more than five trading dates before the issue, I also incorporate the issue month in the bid-ask spread estimation (only the period preceding the issuance date is incorporated).

<sup>19</sup> 376 of the sample firms have Ticker data available on DealScan, but 78 tickers are outdated and can not be matched with COMPUSTAT/CRSP.

<sup>20</sup> Some of the borrowers change their status from public to private or vice versa over time. I am careful to control for the specific issuance date of the firm's loans to appropriately classify publicly reporting and/or traded firms during the sample period.

<sup>21</sup> The matching procedure is sufficiently accurate: 80% of the borrowing firms are matched on all three parameters (name, industry affiliation and state location).

address the specificity of the pricing of a syndicated loan, I also employ the distinctive characteristics of loan syndications.

#### *Loan size*

A loan's size may be an important determinant of the interest rate spread of syndicated loans. Information asymmetries tend to be less severe for large loans, since any fixed costs associated with obtaining information about a borrower are less of an obstacle for large loans (Jones et al., 2005). Thus, the lender's uncertainty regarding a borrower's default risk may be smaller for large loans, leading to lower interest rate spreads. In addition, loan size may indicate economies of scale in loan production and monitoring (Booth, 1992), which also lead to a cost advantage. Alternatively, large loans lead to a higher lenders' exposure to a borrower- or industry-specific risk and this exposure may potentially cause higher default premium. In the recent years, institutional investors and banks also value the ability to sell loans on the secondary market and smaller loan facilities are considered to be better candidates for the secondary trade (Standard & Poor's, 2003). Consequently, larger loans may be priced at higher interest rates. While the economic forces mentioned above may lead to either a negative or positive relation between loan size and loan pricing, the majority of prior studies find that larger loans are priced at lower interest rate spreads (e.g. Booth, 1992, Beatty et al., 2002, and Bharath et al., 2004a). For the sample that incorporates both publicly reporting and private borrowers, loan size is estimated by a logarithm of the facility's amount. For the sample of publicly reporting borrowers only, loan size is estimated relative to a borrower's size: the facility's amount is deflated by the borrower's total assets in the year prior to entering into a loan contract.<sup>22</sup>

#### *Firm size*

Bharath et al. (2004a) suggest that small borrowers have greater information asymmetries. Generally, firm size is a widely used proxy for the amount of public information available

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<sup>22</sup> Because the information regarding a borrower's assets is not available on the DealScan database, I can not estimate the relative size of the loans of private borrowers.

regarding a firm (Diamond and Verrecchia, 1991, and Harris, 1994). As a result, loans of larger borrowers are expected to be priced at lower spreads. In addition, larger firms have a lower probability of financial distress (Mansi et al., 2005), leading to the lower default risk premium. Previous research supports the negative relation between the borrower's size and loan pricing (e.g. Beatty et al., 2002, Bharath et al., 2004a, Bharath et al., 2004b, and Harjoto et al., 2004). I incorporate the borrower's size into the analysis of publicly reporting borrowers' loans<sup>23</sup>; firm size is estimated by a logarithm of the borrower's total assets in the year prior to a loan issue.

### *Credit Rating*

The evaluation of the borrower's credit quality by an independent credit agency also has been shown to be important in corporate debt pricing. Unlike previous studies, I am careful to control for all potentially available firm- and loan-specific credit rating categories, including the S&P Sr. Debt, S&P Loan Rating, Moody's Sr. Debt, Moody's Loan Rating, Fitch LT and Fitch Loan Rating. The corporate ratings capture the risk of default, whereas loan ratings also address the loss-given-default risk. The loss-given-default risk assesses the expected loss that the lender would incur in the event of default; this risk is largely determined by the likelihood of the borrower's recovery.<sup>24</sup>

I set a corporate credit rating variable equal to one if the S&P senior debt rating is AAA, through 22 if the S&P senior debt rating is D, which is the lowest rated debt in my sample. For borrowers not rated by Standard & Poor's, I assign them Moody's senior debt rating, converted to an equivalent S&P rating.<sup>25</sup> The corporate credit rating variable is set to 23 for firms without an

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<sup>23</sup> Because DealScan does not provide borrowers' asset data, I do not include the firm's size in the analysis of the total sample of public and private borrowers. When the firm size is estimated by a logarithm of the borrower's annual sales, I find an insignificant relation between the interest rate spread and the firm's size. In addition, the incorporation of the borrower's annual sales measure in the regression does not diminish the power of information asymmetry and other explanatory variables in explaining the interest rate spread.

<sup>24</sup> More specifically, in valuating a loan, credit agencies assess the loss-given-default risk based on the following factors: the collateral (if any) backing the loan, the amount of other debt and equity subordinated to the loan, the degree of control over the collateral security that the lender exercises, and covenant constraints that may allow the lender to renegotiate the terms of a loan before other creditors.

<sup>25</sup> I use a conventional conversion scheme which matches S&P and Moody's ratings in a following manner: S&P AAA ratings are equivalent to Aaa ratings according to the Moody's system, AA ratings are

available S&P or Moody's senior debt rating.<sup>26</sup> The loan-specific credit rating variable is computed using an equivalent conversion procedure. Syndicated loans which are not rated by either of the credit rating agencies are not assigned the numerical loan rating variable.

### *Maturity*

Longer loan maturity is expected to be associated with higher default risk compared to that of the shorter term loans (Flannery, 1986, and Angbazo et al., 1998). However, previous studies indicate an ambiguous relation between debt pricing and maturity. While Angbazo et al. (1998) and Mullineaux and Yi (2003) find that longer maturity loans generate higher yields, Dennis et al. (2000) find that credit spreads decline with maturity. Several other studies find an insignificant relation between maturity and the cost of debt (Booth, 1992, Beatty et al., 2002, Bharath et al., 2004a, Harjoto et al., 2004, and Zhang, 2004).<sup>27</sup> Maturity is estimated by the number of months between the facility's issue date and the date when the facility matures.

### *Revolver*

In addition to the control procedures discussed above, I also control for revolving facilities. Revolving credit is a commitment that permits the borrower to draw down, repay, and re-borrow. This facility, which acts like a credit line, provides additional flexibility to the borrower, but increases the risk to the lender. Because a revolver exposes the lender to the considerable changes in its commitment, compared to the term loan, the revolving facility is more likely to be subject to takedown risk (Ho and Saunders, 1983). This considerable uncertainty regarding the lender's exposure should cause higher required credit spreads on the revolving facilities.

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equivalent to Aa ratings, A ratings are equivalent to A ratings, BBB ratings are equivalent to Baa ratings, BB+ ratings are equivalent to Ba1 ratings, BB ratings are equivalent to Ba2 ratings, BB- ratings are equivalent to Ba3 ratings, B+ ratings are equivalent to B1 ratings, B ratings are equivalent to B2 ratings, B- ratings are equivalent to B3 ratings, CCC ratings are equivalent to Caa ratings, CC ratings are equivalent to Ca ratings, and C ratings are equivalent to C ratings.

<sup>26</sup>All the sample facilities that do not have Standard & Poor's or Moody's firm- and loan-specific ratings are also not rated by Fitch-ICBA.

<sup>27</sup> Booth (1992) partially explains these results by demonstrating that the relation between pricing and maturity differs across debt pricing options. He shows that the relation between maturity and the interest rate spread is negative for loans priced above prime and positive for loans priced above LIBOR and CD; this leads to an insignificant relation when loans with different pricing options are considered together in the analysis.

Despite the higher takedown risk of revolving loans, previous studies find that revolvers have lower interest rate spreads than term loans (Angbazo et al., 1998, Harjoto et al., 2004, Zhang, 2004, and Asquith et al., 2005). This surprising result is partially explained by the regulatory capital requirements regarding short term revolvers. Banks can offer a revolver with a maturity of less than 365 days without being required to increase regulatory capital reserves to cover the unused portion of the revolving facility. Because part of the revolving commitment need not be backed by regulatory capital, revolving facilities may be priced at lower interest rate spreads. Revolving facilities are identified by an indicator variable taking the value of one if the facility's type is a revolver, zero otherwise.

#### *Security*

Collateral is expected to reduce the sensitivity of the loan's cash flows to information asymmetry regarding the borrower. However, the majority of the previous studies demonstrate that secured loans have significantly higher rates than unsecured ones (e.g. Booth, 1992, Angbazo et al., 1998, Casolaro et al., 2004, Harjoto et al., 2004, and Asquith et al., 2005). Berger and Udell (1990) explain this phenomenon by documenting that collateral is typically associated with riskier loans. Rajan and Winton (1995) also demonstrate that collateral is more likely to be observed in loans to firms which require extensive monitoring and that the collateralization of private debt is associated with higher probability of financial distress. Secured facilities are identified by an indicator variable taking the value of one if the facility is backed by collateral, zero otherwise.

#### *Loan type (i.e., institutional term loan or amortizing term loan)*

The examination of the loan pricing in the syndicated loan market requires differentiating between institutional and amortizing term loans. Institutional term loans (term loans B, C and D)<sup>28</sup>, which are issued by institutional investors, typically have longer maturity and back-end-

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<sup>28</sup> Institutional term loan is an installment loan. An installment loans is a loan commitment that does not allow the amounts repaid to be re-borrowed. The funds are typically drawn down all at once, though the loan may have a series of takedowns or a delayed takedown period. A borrower repays an installment loan based on either a scheduled series of repayments or a one-time lump-sum payment at maturity.

loaded repayment schedules compared to amortizing term loans (term loan A)<sup>29</sup>, which are issued by banks. Institutional term loans are identified by an indicator variable taking the value of one if the loan's type is term loan B, C or D, zero otherwise.

*Number of lenders in the syndicate*

An additional distinctive characteristic of syndicated loans is the relatively big number of syndicate lenders. I control for a number of participants in the loan syndicate because prior research suggests that the number of participants is strongly related to the quality of information about the borrower and the borrower's default probability. Lee and Mullineaux (2004) and Sufi (2005) find that a syndicate is structured with fewer lenders when a borrower is more informationally opaque.<sup>30</sup> Lee and Mullineaux (2004) also show that syndicates are smaller when a borrower has a higher default probability. These findings suggest a negative relation between the number of syndicate participants and the interest rate spread. However, Sufi (2004) suggests that when a borrower is more likely to default, the arranger adds participants to the syndicate. Because lenders' unanimity is required to change major terms of the loan, adding participants make renegotiation more difficult and prevents strategic default by the borrower. Thus, a higher number of lenders in a syndicate may indicate a higher expected default probability, suggesting a positive relation between the interest rate spread and the number of participants.

I also control for additional loan characteristics such as the loan purpose, financial covenants and the interest-increasing performance pricing option. The analysis of the loans of public borrowers also incorporates leverage, interest-coverage and profitability measures (all the measures are estimated in the year prior to entering into a loan contract).<sup>31</sup> In addition, all the

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<sup>29</sup> An amortizing term loan is an installment loan with a progressive repayment schedule; it is typically syndicated along with revolving credits as part of a large syndication.

<sup>30</sup> Previous studies suggest that loans to information-opaque borrowers are also characterized by a larger portion of a loan retained by the arranger (Simons, 1993, Dennis and Mullineaux, 2000, and Sufi, 2005). For my research sample, only twelve percent of the loans have the arranger's proportion data available, which prevents incorporating this variable into the analysis.

<sup>31</sup> Leverage is measured as the ratio of the long-term debt to total assets; interest coverage is measured by the ratio of EBITDA to interest expense; profitability is measured by the ratio of EBITDA to total assets.

empirical estimations include year fixed-effects to account for common macroeconomic factors in loan pricing. I also incorporate industry fixed effects: loan pricing may differ across industries, reflecting industry-wide economic conditions and profitability prospects.<sup>32</sup> Furthermore, standard errors are robust to heteroskedasticity and are clustered at the firm level.

### **3.3 Control variables: empirical determinants of debt maturity**

I incorporate into the analysis loan- and firm-specific characteristics that prior literature has documented as being associated with debt maturity. I also include distinctive attributes of syndicated loans which may be related to debt maturity choices in the syndicated loan market.

#### *Firm size*

Previous studies do not find conclusive empirical evidence on the impact of firm size on maturity. Barclay and Smith (1995) find that debt maturity generally increases with firm size, but this relation appears to be nonmonotonic for the largest firms. Stohs and Mauer (1996), Scherr and Hulbert (2001), and Ortiz-Molina and Penas (2005), who employ firm size to proxy for information opacity, find that larger firms obtain longer maturity. However, Guedes and Opler (1996) and Johnson (2003) show a U-shape pattern in the relation between firm size and maturity: smaller firms issue in the middle of the maturity spectrum, while larger firms issue at both extremes of the spectrum. Bharath et al. (2004b) find a negative relation between firm size and maturity. In addition to controlling for the borrower's size, in the maturity estimations, I also address the loan size.

#### *Credit risk*

Flannery (1986) claims that because of larger information costs associated with long-term debt, high-quality firms would prefer to issue less underpriced short term debt. At the same time, low-quality firms would prefer to borrow overpriced long-term debt, leading to the negative

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<sup>32</sup> For instance, loans of telecom companies were priced favorably relative to other sectors in the late 90's.

relation between credit quality and debt maturity. However, Diamond (1991) demonstrates a nonmonotonic relation between the borrower's credit quality and debt maturity. His model suggests that the optimal maturity structure trades off a borrower's favorable private information about its future creditworthiness against a borrower's liquidity risk. The model's implications are as follows: borrowers with a high credit rating issue short term debt due to a low liquidation risk and the high probability of a credit rating improvement; borrowers with lower credit ratings prefer long term debt to avoid liquidation; borrowers with poor credit ratings are unable to issue long term debt because they are screened out of the long term debt market due to moral hazard problems. Thus, borrowers who rely on the short-term debt are a mix of the high- and low-rated borrowers, whereas the middle-rated borrowers are being issued more long term debt. To address the possible nonlinearity in the relation between credit rating and maturity, I incorporate into the analysis both the corporate credit rating and the square term of this variable.

#### *Asset maturity*

Previous empirical evidence on the impact of asset maturity on debt maturity choices is ambiguous. Barclay et al. (2003) and Johnson (2003) find that firms match the maturity of their assets with the maturity of their liabilities; matching maturity choices may assist borrowers to issue longer maturity debt without significantly increasing the agency costs associated with long-term liabilities. However, Guedes and Opler (1996) suggest that the proposition that firms match the maturity of assets and liabilities is only partly correct. For the sample of publicly reporting borrowers, I incorporate into the analysis the asset maturity measure which is utilized by prior research (Stohs and Mauer, 1996, Johnson, 2003, and Bharath, et al., 2004b):

$$Asset - Maturity = \frac{CA_i}{CA_i + PPE_i} * \frac{CA_i}{COGS_i} + \frac{PPE_i}{CA_i + PPE_i} * \frac{PPE_i}{Depreciation_i},$$

where  $CA_i$  is the current assets of firm  $i$ ,  $PPE_i$  is the net property, plant and equipment of firm  $i$ ,  $COGS_i$  is the cost of goods sold of firm  $i$ , and  $Depreciation_i$  is the depreciation and amortization expense of firm  $i$ . The asset maturity measure is estimated in the year prior to entering into a loan contract.

### *Growth options*

Prior research shows that firms with higher growth options tend to issue more short-term debt (Barclay and Smith, 1995, Guedes and Opler, 1996, Barclay et al., 2003, and Johnson, 2003). This finding is consistent with Myers' (1977) prediction that firms with greater growth opportunities can control for underinvestment problem by shortening debt maturity. More specifically, Myers (1977) demonstrates that the issuing of debt that expires before the growth options are to be exercised helps to solve the underinvestment problem. Following previous studies, I estimate growth options by the borrower's market-to-book ratio, R&D intensity and asset tangibility.<sup>33</sup> I incorporate all these variables in the debt maturity estimation for the sample of publicly reporting borrowers.

I also control for additional loan characteristics such as loan type, loan purpose, number of lenders, and the existence of financial covenants and collateral. In addition, all the empirical estimations include 2-digit industry and year fixed-effects. Furthermore, standard errors are robust to heteroskedasticity and clustered at the firm level.

### **3.4 Descriptive statistics**

Table 2, Panel A presents summary statistics for the total sample of syndicated loans.<sup>34</sup> Loans are priced at relatively high interest rate spreads<sup>35</sup>, with a mean and median of about 300 basis points above LIBOR. The bid-ask spread measure based on the secondary loan trade has a mean of 1.194% and a median of 0.668% of par value; on average, this information asymmetry

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<sup>33</sup> Market-to-book ratio is the ratio of the market to book value of the borrower's equity; R&D intensity is the ratio of the borrower's R&D expenditures to its sales; asset tangibility is the ratio of the PPE to the total borrower's assets. All these variables are estimated in the year prior to entering into a loan contract.

<sup>34</sup> I winsorize the interest rate spread, loan maturity and all the explanatory variables at the 1% and 99% level.

<sup>35</sup> The interest rate spread is based on the All-In-Spread-Drawn measure reported by the DealScan database. This measure is equal to the amount the borrower pays in basis points over LIBOR for each dollar drawn down, so it accounts for both the spread of the loan and the annual fee paid to the bank group. LPC always uses the LIBOR spread or LIBOR equivalent spread option to calculate the All-In-Drawn spread.

measure is based on the 9-month trading history of the two borrower's previous loans traded on the secondary loan market. The median sales of the sample borrowers are \$753 millions. The sample loans are characterized by a median size of \$150M and the median maturity of 60 months. The typical syndicated loan is issued to a borrower with a B+ S&P senior debt rating (or with a B1 senior debt rating in Moody's equivalent rating system); a majority (90%) of the sample loans are leveraged issues. 26 percent of the sample facilities also have a specific loan rating; the typical loan is rated BB- by S&P (or Ba3 by Moody's). As far as the syndicate structure is concerned, the sample loans have on average 11 syndicate participants (including the arranger).

The further analysis of loan characteristics indicates that institutional term loans represent about 32 percent of the sample facilities. About 39 percent of the sample loans are revolving facilities. In terms of loan purpose characteristics, 23 percent of the loans are issued with a primary purpose of Takeover, LBO/MBO or Recapitalization. Loan agreements of 17 percent of the sample facilities are characterized by the interest-increasing performance pricing option; this option gives lenders the right to receive higher interest rates if the borrower's credit quality deteriorates (Asquith et al., 2005).<sup>36</sup> In addition, contracts for most of the sample loans include a financial covenant package: 63% of the traded loans are constrained by at least one financial covenant. The interest coverage restriction (Min Interest Coverage and Min Fixed Charge Coverage<sup>37</sup>) and the restriction that constrains the amount of debt relative to a firm's profitability (Max Debt to EBITDA and Max Senior Debt to EBITDA) are the ones most commonly used; 35% of the sample loans are subject to these covenant constraints. Furthermore, 65 percent of the sample facilities are issued to publicly reporting borrowers. Finally, for a sub-sample of 1,739

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<sup>36</sup> 40 percent of the sample loans are subject to the performance pricing provision, which includes both interest-increasing performance pricing option and interest-decreasing performance pricing option. Because Asquith et al. (2005) show that interest-decreasing performance pricing option does not influence the original interest rate spread charged on the syndicated loan, I address only the interest-increasing performance pricing option.

<sup>37</sup> These covenants are commonly defined in the following way: Interest Coverage - EBITDA divided by Interest Expense; Fixed Charge Coverage - EBITDA divided by interest charges paid plus long-term lease payments. Though, there exists a substantial variety in the definition of covenants across loan contracts; for a detailed discussion see Dichev and Skinner (2002).

syndicated loans, the DealScan database identifies whether they are backed by collateral; 93 percent of these facilities are secured.

Table 2, Panel B presents summary statistics for the sample of syndicated loans issued to publicly reporting borrowers. The univariate analysis indicates that loans of public borrowers are priced at lower spreads than loans of private firms. Furthermore, the bid-ask spread measure related to loans of public borrowers indicates lower information asymmetry associated with these loans. In addition, loans of public firms are bigger in size and are issued by syndicates with higher number of participants. Moreover, lenders more often impose financial covenant constraints on loans of public borrowers. I also report summary statistics on the financial statement variables of public borrowers: leverage, interest-coverage, profitability, asset-maturity, asset tangibility, and R&D intensity.

## **4. Empirical results**

### **4.1 The impact of information asymmetry on loan pricing**

#### *Estimation of the interest rate spread on the loans of public and private borrowers*

Table 3, Column (1) presents the results from estimating the loan interest rate spread for the total sample of publicly reporting and private borrowers. There is clear evidence that the interest rate spread on the syndicated loan issues is positively related to the information asymmetry measure. This result is statistically and economically significant; an increase of one standard deviation in the *Bid-ask-spread* variable is associated with an increase of 27.5 basis points in the interest rate spread. This effect is substantial, given that it constitutes 9.2% of the median interest rate spread for the sample loans. These results demonstrate that information asymmetry regarding a borrower increases the cost of debt capital.

The loadings on all control variables are consistent with the predicted relations. The negative coefficient estimate on the *Loan-size* variable suggests that larger facilities are priced at

lower interest rate spreads. This finding is consistent with two explanations suggested by prior research: 1) the higher amount and quality of information available regarding larger debt facilities significantly reduces lender's uncertainty regarding a borrower's default risk, and 2) economies of scale in loan production and monitoring lead to a lower interest rate spread. Additionally, there is an economically and statistically significant relation between the *Corporate-rating* variable and the cost of syndicated loan financing.<sup>38</sup> An increase of one standard deviation in *Corporate-rating* is associated with an increase of 12.8 basis points in the interest rate spread. Consistent with prior studies, I do not find that longer loan maturity generates higher interest spreads. In addition, I do not observe that revolving facilities are priced at significantly lower interest rates.<sup>39</sup>

As evidenced in Table 3, Column (1), institutional loans experience higher interest spreads. This finding may be partially explained by a longer maturity and a back-end-loaded repayment schedule of institutional loans compared to the maturity and repayment schedule of loans issued by banks.<sup>40</sup> In addition, a wide range of research, including Diamond (1984 and 1996), James (1987), and Gorton and Winton (2002), support the proposition that banks are more efficient than other financial institutions in screening and monitoring the borrowers. Banks' higher efficiency in loan managing may also lead to lower required credit spreads on amortizing term loans.

I also examine the pricing of loans with a primary purpose of Takeover, LBO/MBO and Recapitalization, since these types of loans indicate a considerable change in a borrower's capital structure. The results suggest that these loans are not priced at higher spreads than loans issued for more general purposes, such as debt repayment, working capital and corporate operations.

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<sup>38</sup> Because loan rating captures both default risk and loss-given default risk, but corporate rating addresses only the risk of default, I do not incorporate the two types of ratings simultaneously in the analysis. Less than four percent of the sample facilities which lack corporate credit rating have an available loan rating.

<sup>39</sup> The majority (95%) of the revolving facilities in my research sample are long-term revolvers (above one year); previous studies typically examine 364-day revolving facilities. In contrast to short-term revolvers, for long-term revolving facilities both used and unused portion of the facility should be backed by regulatory capital.

<sup>40</sup> Longer maturity and back-end-loaded repayment schedule of institutional term loans indicate that these facilities have a longer duration than amortizing term loans. A longer duration typically increases both the credit risk and interest rate risk of the lender, and this increased lender's exposure translates into higher required rates of return. Because data regarding the facility's duration is not available for the majority of the sample loans, it is not possible to directly control for the duration's effects on the interest rate spread.

Consistent with Asquith et al. (2005), lenders charge lower rates when an interest-increasing performance pricing option is included in the contract. In addition, I control for the existence of financial covenant constraints in the loan agreements. I find a positive relation between the inclusion of financial covenants in loan contract and loan pricing. This result is driven by the endogenous relation between these variables. Covenants restrict the borrower's financial activity and therefore decrease the uncertainty to the lender. However, as a borrower's financial risk increases, syndicate lenders impose more tightly and more extensive covenants (Standard & Poor's, 2003). Bradley and Roberts (2004) and Chava et al. (2004) also support the simultaneity between covenants inclusion in the debt contract and their effect on the cost of debt.

A negative relation between the *Number-of-lenders* variable and interest rate spread is consistent with the higher transparency and the lower default probability of loans issued by syndicates with a high number of participants. An increase of one standard deviation in the *Number-of-lenders* variable is associated with a decrease of 9.7 basis points in the interest rate spread. Finally, I differentiate between loans of publicly reporting and of private borrowers. Facilities of publicly reporting firms experience interest rate spreads that are 17.7 basis points lower than interest spreads on facilities of private firms. Lower spreads on the syndicated loans of public borrowers reflect the higher amount and quality of information available regarding these borrowers. In addition, syndicated loans of public borrower typically experience a lower default rate<sup>41</sup>, which further contributes to lower rates of return required by lenders on these facilities.

The model's explanatory power is relatively high: the model explains 34% of the variation in the average interest rate spread.<sup>42</sup> The estimation includes industry and year fixed-effects, but the explanatory power is not driven by the incorporation of the fixed effects in the regression.<sup>43</sup> In

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<sup>41</sup> The analysis of traded loans of public and private borrowers suggests that the proportion of loans in distress is almost twice as high for private borrowers as for public borrowers (Wittenberg-Moerman, 2005).

<sup>42</sup> A majority of the explanatory variables employed in the empirical analysis are not highly correlated. The Pearson/Spearman rank correlation coefficients are considerably high only for the two pairs of explanatory variables: *Maturity* and *Institutional* (0.42), and *Revolver* and *Institutional* (-0.55).

<sup>43</sup> Estimating the model without industry and year fixed effects results in Adj R-Sq of 30.4%.

addition, the results are robust to inclusion of additional control variables, such as specific types of financial covenants, additional dummies for loan type and purpose, the borrower's annual sales, the interest rate on the borrower's previous syndicated facilities, and the average price of the borrower's traded loans.

*Estimation of the interest rate spread on the loans of public borrowers*

For the loans of publicly reporting borrowers, I employ a richer information set which also includes borrowers' financial statement measures (Table 3, Column (2)).<sup>44</sup> As expected, the loans of larger borrowers and the loans of more profitable borrowers are priced at lower interest rate spreads, while the loans of more leveraged borrowers experience higher interest rates. The effect of all these variables on loan pricing is also economically significant.<sup>45</sup> For the liquidity measure, I do not find a significant relation between the interest rate spread and the interest-coverage ratio.

I also examine whether the loans of borrowers publicly traded on stock exchanges are priced at lower spreads relative to the loans of borrowers that only report to the SEC. I find a negative relation between the interest rate spread and the *Traded* indicator variables<sup>46</sup>. The differential pricing of loans of publicly reporting and publicly traded borrowers reflects the differences in their information environment and default probability.

The incorporation of all these additional control variables into the empirical analysis does not diminish the power of information asymmetry in explaining the interest rate spread. From the results reported in Table 3, Column (2), it is immediately apparent that information asymmetry regarding a borrower increases the cost of debt capital. The impact of information asymmetry on loan pricing is statistically and economically significant: an increase of one standard deviation in

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<sup>44</sup> To perform a regression analysis, I exclude loans of public borrowers without data available on the borrower's total assets, long-term debt, EBITDA and interest expense. These procedure results in a sample of 1,482 syndicated loans representing 442 borrowers.

<sup>45</sup> An increase of one standard deviation in the *Firm-size* and *Profitability* is associated with a decrease of 34 and 24 basis points in the interest spread, respectively. An increase of one standard deviation in the *Leverage* variable is associated with an increase of 15 basis points in the spread.

<sup>46</sup> *Traded* - an indicator variable taking the value of one if a borrower is a publicly traded firm on U.S. stock exchanges in the year when facility is issued in the syndicated loan market, zero otherwise.

the *Bid-ask-spread* variable increases the interest rate spread of a syndicated loan by 25.1 basis points. This effect constitutes 9.1% of the median interest rate spread across loans of publicly reporting borrowers.

The model's overall explanatory power is high and is not driven by the incorporation of the industry and year fixed-effects in the regression.<sup>47</sup> In addition, the relation between the interest rate spread and the control variables has the predicted signs, is, in general, significant and is consistent compared to the total sample of public and private borrowers. Furthermore, the impact of information asymmetry on loan pricing is robust to the inclusion of numerous control variables: different types of financial covenants, additional dummies for loan type and purpose, interest rate on the borrower's previous syndicated facilities, the average price of the borrower's traded loans, and the borrower's market-to-book ratio, R&D intensity, and earnings and cash flow volatility. These findings further support the robustness of the analysis.

#### **4.2 Additional robustness tests of the loan pricing estimation**

Tables 4-7 offer additional specifications to test the robustness of the results. First, the empirical findings are robust to different clustering procedures. Clustering at the year level provides qualitatively similar results for both the total sample of loans of public and private borrowers and the sample of loans issued to public borrowers only (Table 4). Second, to verify that the empirical findings are not caused by not controlling for loan collateral, an additional analysis is performed for the sample of loans for which DealScan identifies whether they are backed by collateral. Consistent with the results from previous studies, secured loans are priced at higher interest spreads than unsecured ones (Table 5). Despite the substantial reduction in the

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<sup>47</sup> Estimating the models without industry and year fixed effects results in the reduction of Adj R-Sq by about 4.7%. In addition, a majority of the explanatory variables employed in the empirical analysis are not highly correlated. The Pearson/Spearman rank correlation coefficients are considerably high only for the three pairs of explanatory variables: *Maturity* and *Institutional* (0.45), *Revolver* and *Institutional* (-0.52), and *Loan-size* and *Firm-size* (-0.48). Negative correlation between loan and firm size variables is caused by deflating the loan amount by the borrower's total assets.

sample size, the explanatory power of the model increases and the information asymmetry variable continues to be significantly related to the interest rate spread.

Third, I restrict the analysis to the sample of facilities with available loan rating data. In addition to the default risk, the loan rating also captures expected loss that the lender would incur in the event of a borrower's default. Therefore, incorporating the loan rating in the empirical estimation of the interest rate spread allows to better control for the credit risk exposure associated with providing funds to the borrower.<sup>48</sup> The results presented in Table 6 demonstrate a significant relation between the interest rate and the trading spread in this specification (for both the total sample and the sample of public borrowers only). Furthermore, the untabulated results demonstrate that all the core findings are robust to performing the analysis for the sample of facilities with an available corporate credit rating and for the sample of facilities with an available S&P senior debt rating.<sup>49</sup> I interpret the results of these robustness tests as further verification of the importance of information asymmetry in loan pricing.

Fourth, I examine whether the empirical findings are sensitive to the interest rate measure employed in the analysis. Because Angbazo et al. (1998) demonstrate that loan rate and annual (commitment) fees compliment each other, rather than substitute, in the loan pricing process, I base the empirical analysis on the All-In-Spread-Drawn which incorporates both the spread of the loan and the annual fee paid. Untabulated results demonstrate that the findings are almost identical when the interest rate spread excluding annual fees is incorporated into the regression analysis. Furthermore, for loan contracts that include a performance pricing provision, *Bid-ask-spread* is found to be significantly related to both a maximum interest spread and a minimum

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<sup>48</sup> The loan rating is obtained prior to offering the loan to potential syndicate participants or just after the loan closing. While the loan rating cannot directly influence the loan rate when it is not issued before a loan is syndicated, the information reflected in the rating nevertheless is associated with the interest rate spread, assuming that the arranger has access to the same (or better) information as the rating agency (Mullineaux and Yi, 2003). In addition, rating agencies also issue a "prospective" rating before the loan closing, which further alleviates the concern regarding the rating's issuance date.

<sup>49</sup> The results are also robust to an alternative definition of the *Corporate-rating* variable; when *Corporate-rating* is set to zero for firms without an available S&P or Moody's senior debt rating, the core results are unchanged.

interest spread. These results indicate that the whole performance pricing grid, not only the original interest rate charged on a loan, increases with an increase in information asymmetry.

The analysis is also robust to using alternative specifications of the *Bid-ask spread* variable. To address the concern that the loan contractual terms are being negotiated some period in advance of the loan start date, I exclude from the *Bid-ask spread* estimation the trading spreads during the loan issue month. The results are almost identical following this procedure. As an additional robustness test, I restrict the analysis to loans for which *Bid-ask spread* measure is estimated based on more than one month of the loan trading data.<sup>50</sup> The information asymmetry variable continues to be significantly related to the interest rate spread in this specification (for both the total sample and the sample of public borrowers).

Finally, I incorporate into the empirical analysis a variable reflecting the discrepancy between S&P's and Moody's loan rating. Morgan (2002) suggests that the disagreement between rating agencies indicates the information opacity of the borrower. Since the loan ratings I employ in the analysis are the initial loan ratings assigned around the loan issuance date, the discrepancy between the rating agencies can not be caused by asynchronous changes in the loan rating over time.<sup>51</sup> I estimate the disagreement in the loan rating by the *Rating-discrepancy* variable which is set equal to the absolute difference between S&P's and Moody's loan ratings. Despite the extremely low sample size in this estimation, the *Bid-ask-spread* variable has an important impact on loan pricing (Table 7). The discrepancy between the rating agencies is also associated with higher interest spreads, but this effect is considerably less significant than that of the *Bid-ask-spread* measure.

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<sup>50</sup> This procedure results in a sample of 2,192 syndicated loans issued to public and private borrowers; for public borrowers, the sample is 1,311 syndicated loans.

<sup>51</sup> Since the discrepancy in the borrower's ratings may be driven by the timing differences in the corporate rating updates, I restrict this analysis to facilities with available loan rating. In addition, the analysis requires the loan to be rated by both rating agencies, resulting in a low sample size in this specification.

### **4.3 The impact of information asymmetry on loan maturity**

The results presented in Table 8 demonstrate a significant relation between loan maturity and the *Bid-ask-spread* variable.<sup>52</sup> This evidence suggests that syndicate lenders issue loans with shorter maturities to informationally opaque borrowers. A short loan maturity induces more frequent refinancing of the borrower's liabilities, which allows lenders to more frequently renegotiate the loan contractual terms. The impact of information asymmetry on loan maturity is both statistically and economically significant. For the total sample of syndicated loans and for the sample of loans issued to public borrowers, an increase of one standard deviation in the *Bid-ask-spread* variable reduces the loan maturity by 5 months. This effect represents around 8 percent of the median loan maturity of the sample loans.

Empirical findings also suggest that loan maturity increases with loan size, but it decreases with the size of the borrower's total assets.<sup>53</sup> Consistent with Diamond (1991), I find a nonmonotonic relation between the borrower's credit quality and debt maturity. Generally, syndicate lenders issue loans with a longer maturity to risky borrowers; however, as a borrower's credit quality deteriorates, the loan maturity decreases, consistent with stronger moral hazard problems associated with providing credit to poor quality borrowers. As expected, institutional loans and loans with a primary purpose of Takeover, LBO/MBO and Recapitalization are characterized by longer maturity. The results in Table 8 also indicate that financial covenants are associated with longer maturity. Because financial covenant restrictions mitigate the consequences of borrower-lender informational asymmetries, imposing financial covenants apparently allows lenders to issue loans with a longer maturity. I also examine the relation between *Number-of-lenders*, *Asset-maturity*, *Asset-tangibility* and loan maturity; I do not find that these variables have a significant impact on loan maturity choices.

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<sup>52</sup> All the core results are unchanged when a logarithm of a loan maturity is incorporated as the dependent variable in the empirical analysis.

<sup>53</sup> These opposite relations are probably caused by estimating the loan size as the loan amount relative to the borrower's total assets.

The results are robust to many different empirical specifications. Clustering at the year level provides almost identical results (Table 9). Controlling for loan collateral also does not change the empirical findings (Table 10). Furthermore, all the core results are robust to performing the analysis for the sample of facilities with available loan credit rating (Table 11). Because prior research suggests that information asymmetry regarding the borrower is strongly associated with its growth opportunities, I limit the sample to facilities with R&D data available (Table 12). The *Bid-ask spread* variable continues to be significantly related to loan maturity in this specification, and the impact of this variable on loan maturity is much stronger than that of *R&D-intensity*. To address the concern that the relation between maturity and *R&D-intensity* is influenced by omitting observations with missing R&D data, I assign to all the borrowers with missing R&D data the level of R&D expense equal to one-half percent of the firm's annual sales. This adjustment is driven by R&D disclosure requirements that exempt firms from disclosing low levels of this expenditure. Following this adjustment, the empirical findings do not change.<sup>54</sup>

The relation between loan maturity and the control variables is consistent across all the different estimation samples employed in the analysis, which further supports the robustness of the results. Furthermore, the empirical findings are robust to the inclusion of additional loan- and borrower-specific characteristics, such as revolver, performance-pricing provision, specific types of financial covenants, additional dummies for loan type and purpose, interest spread, the loan credit rating discrepancy across rating agencies, the maturity of the borrower's previous syndicated facilities, the average price of the borrower's traded loans, and the borrower's market-to-book ratio, profitability, leverage, and earnings and cash flow volatility. The empirical findings are also robust to using alternative specifications of the *Bid-ask spread* variable.<sup>55</sup>

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<sup>54</sup> For the firms with missing R&D data, as alternative measures of R&D expense, I also use zero and one percent of the annual sales figure. In addition specification, I measure R&D intensity by deflating the R&D expense by the borrower's total assets. In these tests, the empirical findings are similar to those presented in Table 12.

<sup>55</sup> Alternative measures of the *Bid-ask spread* variable include: 1) *Bid-ask spread measure* based on the estimation which does not account for the trading spreads during the loan issue month; 2) *Bid-ask spread*

## **5. Alternative explanations**

### *Bid-ask spread as a proxy for loan price in the secondary trade*

Wittenberg-Moerman (2005) shows that distressed loans<sup>56</sup> are traded at significantly higher spreads than par facilities are; this finding suggests that there is a negative correlation between a loan's bid-ask spread and its secondary trading price. The alternative interpretation of the empirical findings thus is that the loan contractual terms are related to the average price of the borrower's previous loans traded on the secondary loan market. Because loan price reflects the investor's assessment of the borrower's default probability, one possible problem associated with this interpretation is that loan price may be a better proxy for the borrower's default risk than the corporate credit ratings I incorporate into the empirical analysis. This concern is supported by previous studies that suggest that credit agencies frequently lag to update the credit ratings to reflect the recent changes in the borrower's credit conditions (e.g. Hite and Warga, 1997, and Beaver et al., 2004). Consequently, a positive relation between the interest rate spread and the *Bid-ask spread* variable may be primarily attributed to the default risk consideration.

I believe that there are several reasons to reject this interpretation. First, I incorporate into the empirical analysis the average price of the borrower's loans traded on the secondary loan market.<sup>57</sup> The untabulated results demonstrate that while the *Bid-ask spread* variable continues to be significantly related to the interest rate spread, the loan secondary trading price does not have a significant impact on the interest rate. Second, I restrict the analysis to the sample of syndicated facilities with available loan rating. Because the loan ratings I incorporate into the analysis are original loan ratings assigned around the loan issuance date, these ratings do not fall behind the

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measure based on the estimation restricted to the borrower's traded loans with more than one month of the trading data.

<sup>56</sup> Distressed loans are loans traded at a bid price below 90 percent of the par value.

<sup>57</sup> The loan price is estimated over the twelve month period preceding the month of a new syndicated loan issue. If the borrower's loans continue to be traded during the issue month and there are more than five trading dates before the loan issue date, the loan price estimation also incorporates the period from the beginning of the issue month until the loan start date. According to the secondary loan market convention, loan price is measured by the loan bid price in the secondary trade.

changes in the borrower's creditworthiness. The results presented in Table 6 demonstrate that *Bid-ask spread* have both a statistically and an economically significant impact on the interest rate spread in this specification. Third, the negative relation between *Bid-ask spread* and loan maturity, as suggested by the empirical analysis (Tables 8-12), is inconsistent with the credit risk explanation. Because lenders typically issue loans with longer maturity to more risky borrowers, this alternative interpretation predicts a positive relation between trading spreads and the maturity of the syndicated loan issues.

*Bid-ask spread as a proxy for future trading costs*

I realize that the same relation between *Bid-ask spread* and the interest rate might be observed if syndicate lenders perceive trading spreads on the borrower's previous loans as an indication of the bid-ask spread on the borrower's current issue when traded in the future. In this case, loan pricing may reflect liquidity premium that the lenders require to compensate for the expected costs associated with the potential sale of the syndicated loan on the secondary loan market. I believe that this concern is partially alleviated by the empirical evidence that characteristics of the borrower's information environment significantly influence the bid-ask spread in the secondary loan trade (Wittenberg-Moerman, 2005). In addition, only a very small proportion of the syndicated loan issues are subsequently traded on the secondary market; this fact questions the importance of possible trading costs in the pricing of a typical syndicated loan.

*Bid-ask spread as a proxy for the unobservable borrower's characteristics*

There is an additional concern associated with the empirical investigation of the loan contractual terms: that the bid-ask spread on the borrower's traded loans is significantly related to some unobservable characteristic of the borrowing firm. To alleviate this concern, I include in the analysis, to the best of data availability, all the variables that are potentially associated with loan pricing and maturity. Thus, I rigorously control for the determinants of debt pricing and maturity suggested by prior research, as well as for unique characteristics of syndicated loans, such as loan specific ratings, syndicate structure and identity of the lender (i.e., institutional investor or bank).

## **6. Conclusions and future research**

In this paper, I employ a sample of syndicated loans to explore how information asymmetry influences pricing and maturity of private debt contracts. The syndicated loan market offers a methodological advantage in evaluating a borrower's information opacity: as a measure of information asymmetry associated with a borrowing firm, I utilize the bid-ask spread on the firm's loans traded on the secondary loan market. Moreover, the syndicated loan market involves an exceptionally wide range of private debt contracts – loans of public and private borrowers, as well as investment grade and leveraged (high yield) debt issues. Therefore, the syndicated loan market proves to be a promising empirical setting in which to examine the impact of information asymmetry on loan contractual terms.

There are two primary findings in this paper. First, I find that information asymmetry increases the cost of debt capital. Empirical findings demonstrate that, *ceteris paribus*, the interest rate spread on a borrower's syndicated loan is positively related to the average bid-ask spread on its previous loans traded on the secondary loan market. The results are robust to many different empirical specifications. All the core results are unchanged when the analysis is restricted to the sample of facilities with available loan credit rating. The findings are also robust to different clustering procedures and to the incorporation of the numerous control variables. Second, I find that syndicate lenders issue loans with shorter maturities to informationally opaque borrowers. *Ceteris paribus*, there is a negative relation between the syndicated loan's maturity and the average bid-ask spreads on the borrower's traded loans. I show that this result is also consistent across a variety of estimation procedures. This empirical evidence demonstrates that the cost and maturity of private debt financing is determined to a large extent by the information asymmetry associated with a borrowing firm.

The investigation of the impact of information asymmetry on debt pricing and maturity in the syndicated loan market points to new opportunities for future research. First, information

asymmetry may significantly influence other contractual terms of a loan, such as the amount, collateral, tightness of financial covenants and the performance pricing grid structure. How lenders address information asymmetry in setting these additional loan attributes is an open empirical question. Second, very little is known about the interaction between the primary and the secondary loan markets. This paper suggests that the secondary trading spread is an important source of information for syndicate lenders when they shape the structure of subsequent syndicated loan issues. The other information channels between the primary and the secondary loan markets are largely unexplored.

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**Table 1: Sample selection: identification of the traded facilities**

	Number of observations	Number of facilities	% of total trading observations (facilities)
Total trading observations	2,125,589	4,788 <sup>1</sup>	
Trading observations with missing Facility-Id and LIN <sup>2,3</sup>	50,591	266 <sup>4</sup>	2.4% (5.6%)
Trading observations with less than 13-digit LINs <sup>5</sup>	87,274	252	4.1% (5.3%)
Trading observations with available identifier - Facility-Id and/or 13-digit LIN	1,987,724	4,270	93.5% (89.2%)
Observations successfully matched with the DealScan database	1,732,065	3,611 <sup>6,7</sup>	81.5% (75.4%)

1. Because some of the trading observations are not assigned to specific facilities, this number is an approximation to the total number of traded facilities. This proxy is estimated as the number of distinct facilities identified on the Loan Trade Database (4,522) plus the number of firms (266) with traded observations without facility identification. For further details, see footnotes 2, 3 and 4.
2. Facility-ID is a number assigned by DealScan to each syndicated facility. LIN (Loan Identification Number) is assigned to each syndicated facility that is traded on the secondary loan market or has been considered for the trade. Loan Trade Database and DealScan are merged by the Facility-ID and/or LIN numbers.
3. When LPC started covering the secondary loan market, Facility-ID/LIN numbers were not assigned to all trading loans. According to LPC, a majority of loan-trade observations with missing Facility-ID/LINs should belong to this period.
4. Assuming that the borrowers do not change company name during the period of loan trading, there are 266 firms with missing identifiers (Facility-ID and/or LIN numbers.). As a result, there are at least 266 non-identified facilities, because every borrower might have more than one trading facility.
5. LINs with less than 13 digits are assigned to the trading facilities in the following circumstances: a) the traded loan is private and is not covered by DealScan; b) the traded loan is a “prorate piece”-combination of two different facilities; since these two facilities are traded as one piece, but were originated as independent facilities in the primary loan market, prorated pieces can not be directly connected to the DealScan database. All these observations also don’t have a Facility-ID number.
6. The Facility-ID and/or LIN numbers of 659 facilities do not have an appropriate match on the DealScan database.
7. From the total number of identified facilities, 3,464 facilities are issued to U.S. borrowing firms in U.S. dollar currency.

**Table 2: Descriptive statistics****Panel A: Loans of publicly reporting and private borrowers**

Loan Characteristics	Number of observations	Mean	SD	Distribution		
				25%	50%	75%
Interest-rate-spread <sup>1</sup>	2,486	300.7	117.9	250.0	300.0	350.0
Bid-ask-spread <sup>2</sup>	2,486	1.194	1.368	0.500	0.668	1.210
Loan-size <sup>3</sup>	2,486	276.9	479.0	69.10	150.0	300.0
Firm-size (sales) <sup>4</sup>	2,341	2,650	7,743	336.0	753.3	2,147
Maturity <sup>5</sup>	2,486	55.26	24.92	36.00	60.00	72.00
Corporate-rating <sup>6</sup>	2,486	15.90	4.678	13.00	14.00	22.00
Loan-rating <sup>7</sup>	638	12.89	1.64	12.00	13.00	14.00
Number-of-lender <sup>8</sup>	2,486	10.71	10.59	4.00	7.00	14.00
Institutional <sup>9</sup>	2,486	32.30				
Revolver <sup>10</sup>	2,486	38.82				
Purpose-restructuring <sup>11</sup>	2,486	23.45				
Performance-pricing-increase <sup>12</sup>	2,486	17.38				
Covenant-financial <sup>13</sup>	2,486	62.99				
Public <sup>14</sup>	2,486	64.76				
Secured <sup>15</sup>	1,739	92.52				

**Panel B: Loans of publicly reporting borrowers<sup>16</sup>**

Loan Characteristics	Number of observations	Mean	SD	Distribution		
				25%	50%	75%
Interest-rate-spread <sup>1</sup>	1,482	286.5	121.6	225.0	275.0	350.0
Bid-ask-spread <sup>2</sup>	1,482	1.088	1.182	0.487	0.653	1.131
Loan-size <sup>3</sup>	1,482	335.6	543.3	98.40	180.0	375.0
Firm-size (sales) <sup>4</sup>	1,450	3,522	9,376	464.7	1,033	3,253
Firm-size (total assets) <sup>17</sup>	1,482	5,375	15,923	636.8	1,345	3,186
Maturity <sup>5</sup>	1,482	53.14	24.90	36.00	60.00	72.00
Corporate-rating <sup>6</sup>	1,482	14.86	4.406	12.00	14.00	16.00
Loan-rating <sup>7</sup>	422	12.62	1.75	12.00	13.00	14.00
Number-of-lender <sup>8</sup>	1,482	12.14	11.62	4.00	9.00	16.00
Leverage <sup>18</sup>	1,482	0.494	0.293	0.296	0.461	0.626
Interest-coverage <sup>19</sup>	1,482	4.008	6.242	1.669	2.656	4.306
Profitability <sup>20</sup>	1,482	0.123	0.082	0.081	0.118	0.160
Asset-maturity <sup>21</sup>	1,394	5.696	5.954	1.884	3.541	7.332
Asset-tangibility <sup>22</sup>	1,479	0.341	0.222	0.160	0.297	0.473
R&D-intensity <sup>23</sup>	662	0.019	0.036	0.000	0.004	0.020
Institutional <sup>9</sup>	1,482	31.31				
Revolver <sup>10</sup>	1,482	37.58				
Purpose-restructuring <sup>11</sup>	1,482	19.03				
Performance-pricing-increase <sup>12</sup>	1,482	21.73				
Covenant-financial <sup>13</sup>	1,482	72.54				
Traded <sup>24</sup>	1,482	81.31				
Secured <sup>15</sup>	1,130	91.24				

1. The interest rate spread is based on the All-In-Spread-Drawn measure reported by DealScan. This measure is equal to the amount the borrower pays in basis points over LIBOR for each dollar drawn down, so it accounts for both the spread of the loan and the annual fee paid to the bank group.
2. Bid-ask-spread - an average bid-ask spread on the borrower's loans traded on the secondary loan market. The bid-ask spread is estimated over the twelve month period preceding the month of a new syndicated loan issue. If the borrower's loans continue to be traded during the issue month and there are more than five trading dates before the loan issue date, the bid-ask spread estimation incorporates also the period from the beginning of the issue month until the loan start date. The bid-ask-spreads are reported as a percent of par (or cents on the dollar of par value).
3. In millions of dollars.
4. In millions of dollars.
5. Maturity is estimated by the number of months between the facility's issue date and the date when the facility matures.
6. Corporate-rating variable is set as equal to one if the S&P senior debt rating is AAA, through 22 if the S&P senior debt rating is D, which is the lowest rated debt in the sample. For the borrowers not rated by Standard & Poor's, I assign Moody's senior debt rating, converted to an equivalent S&P rating. I use a conventional conversion scheme which matches S&P and Moody's ratings in a following manner: S&P AAA ratings are equivalent to Aaa ratings according to the Moody's system, S&P AA ratings are equivalent to Aa ratings according to the Moody's system, and so on. The corporate credit rating variable is set to 23 for firms without an available S&P or Moody's senior debt rating.
7. The loan-rating variable is set as equal to one if the S&P loan rating is AAA, through 22 if the S&P loan rating is D. For the borrowers not rated by Standard & Poor's, I assign Moody's loan rating, converted to an equivalent S&P rating. I use a conventional conversion scheme which matches S&P and Moody's ratings in a following manner: S&P AAA ratings are equivalent to Aaa ratings according to the Moody's system, S&P AA ratings are equivalent to Aa ratings according to the Moody's system, and so on.
8. Number of participants in the loan syndicate (including the arranger).
9. An indicator variable taking the value of one if the loan's type is term loan B, C or D (institutional term loans), zero otherwise.
10. An indicator variable taking the value of one if the facility's type is revolver, zero otherwise.
11. An indicator variable taking the value of one if the facility's primary purpose is Takeover, LBO/MBO or Recapitalization, zero otherwise. A loan with a primary purpose of recapitalization is a loan to support a material change in a firm's capital structure, often made in conjunction with other debt or equity offerings.
12. An indicator variable taking the value of one if the loan contract incorporates interest increasing performance pricing option, zero otherwise.
13. An indicator variable taking the value of one if a loan agreement imposes financial covenants, zero otherwise.
14. An indicator variable taking the value of one if a borrower is a publicly reporting firm in the year when facility is issued on the syndicated loan market, zero otherwise.
15. An indicator variable taking the value of one if the facility is backed by collateral, zero otherwise.
16. The total sample of syndicated loans includes 1,702 loans issued to publicly reporting borrowers. To perform a regression analysis, I exclude loans without data available on the borrower's total assets, long-term debt, EBITDA and interest expense. This procedure results in a sample of 1,482 loans.
17. In millions of dollars, estimated in the year prior to entering into a loan contract.
18. Leverage is the ratio of the long-term debt to total assets, estimated in the year prior to entering into a loan contract.
19. Interest coverage is the ratio of EBITDA to interest expense, estimated in the year prior to entering into a loan contract.
20. Profitability is the ratio of EBITDA to total assets, estimated in the year prior to entering into a loan contract.
21. Asset maturity is estimated by the weighted average of two ratios: the ratio of current assets to the cost of goods sold, and the ratio of net property, plant, and equipment to depreciation and amortization. These ratios are weighted by the relative size of current assets and net PPE, respectively.
22. Asset tangibility is the ratio of net PPE to total assets, estimated in the year prior to entering into a loan contract.
23. R&D-intensity is the ratio of R&D expenditures to sales, estimated in the year prior to a loan issue.
24. An indicator variable taking the value of one if a borrower is a publicly traded firm on the U.S. stock exchanges in the year when facility is issued on the syndicated loan market, zero otherwise.

**Table 3: Loan pricing as a function of information asymmetry**

$$\text{Interest-rate-spread} = \beta_1 \text{Bid-ask-spread} + \beta_2 \text{Loan-size} + \beta_3 \text{Corporate-rating} + \beta_4 \text{Maturity} + \beta_5 \text{Revolver} + \beta_6 \text{Institutional} + \beta_7 \text{Purpose-restructuring} + \beta_8 \text{Performance-pricing-increase} + \beta_9 \text{Covenant-financial} + \beta_{10} \text{Number-of-lenders} + \beta_{11} \text{Public/Traded} + \beta_{12} \text{Firm-size} + \beta_{13} \text{Profitability} + \beta_{14} \text{Leverage} + \beta_{15} \text{Interest-coverage}$$

	Pred. signs	Total sample	Loans of publicly reporting borrowers
Bid-ask-spread ( $\beta_1$ )	+	20.080*** (2.97)	21.253*** (4.73)
Loan-size ( $\beta_2$ )	-	-27.511*** (3.09)	-84.882*** (21.69)
Corporate-rating ( $\beta_3$ )	+	2.742*** (0.52)	3.059*** (0.81)
Maturity ( $\beta_4$ )	+	0.051 (0.17)	0.070 (0.23)
Revolver ( $\beta_5$ )	?	-6.591 (5.64)	-13.494* (7.66)
Institutional ( $\beta_6$ )	+	55.210*** (7.15)	46.294*** (10.32)
Purpose-restructuring ( $\beta_7$ )	+	9.998 (6.31)	4.100 (8.73)
Performance-pricing-increase ( $\beta_8$ )	-	-61.454*** (6.05)	-58.767*** (7.57)
Covenant-financial ( $\beta_9$ )	?	23.350*** (6.99)	26.721*** (9.97)
Number-of-lenders ( $\beta_{10}$ )	-	-0.911*** (0.25)	-1.119*** (0.30)
Public / Traded ( $\beta_{11}$ )	-	-17.730*** (6.68)	-26.978** (10.70)
Firm-size ( $\beta_{12}$ )	-	-	-24.776*** (5.40)
Profitability ( $\beta_{13}$ )	-	-	-296.63*** (66.05)
Leverage ( $\beta_{14}$ )	+	-	50.936*** (18.80)
Interest-coverage ( $\beta_{15}$ )	-	-	-0.067 (0.80)
Adj R-Sq		34.05%	37.34%
Number of observations		2,486	1,482
Number of clusters		749	442

Regressions include year and industry fixed effects. Standard errors are heteroskedasticity robust, clustered at the firm level. Standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 1, 5 and 10 percent level, respectively.

Variables: **Interest-rate-spread**-the amount the borrower pays in basis points over LIBOR for each dollar drawn down; accounts for both the spread of the loan and the annual fee. **Bid-ask-spread**-an average bid-ask spread on the borrower's loans traded on the secondary loan market; reported as a percent of par. **Loan-size**-total sample: a logarithm of the facility's amount; sample of public borrowers: the ratio of the facility's amount to the borrower's

total assets in the year prior to entering into a loan contract. **Corporate-rating**-the numerical equivalent of the S&P or Moody's senior debt rating. **Maturity**-the number of months between the facility's issue date and the date when the facility matures. **Revolver**-an indicator variable taking the value of one if the facility's type is revolver, zero otherwise. **Institutional**-an indicator variable taking the value of one if the loan's type is term loan B, C or D, zero otherwise. **Purpose-restructuring**-an indicator variable taking the value of one if the facility's primary purpose is Takeover, LBO/MBO or Recapitalization, zero otherwise. **Performance-pricing-increase**-an indicator variable taking the value of one if the loan contract incorporates interest increasing performance pricing option, zero otherwise. **Covenant-financial**-an indicator variable taking the value of one if the loan agreement imposes financial covenants, zero otherwise. **Number-of-lender**-number of participants in the loan syndicate (including the arranger). **Public**-an indicator variable taking the value of one if a borrower is a publicly reporting firm in the year when facility is issued on the syndicated loan market, zero otherwise. **Traded**-an indicator variable taking the value of one if a borrower is a publicly traded firm on U.S. stock exchanges in the year when facility is issued on the syndicated loan market, zero otherwise. **Firm-size**-the size of the firm measured by a logarithm of the borrower's total assets in the year prior to entering into a loan contract. **Profitability**-the ratio of EBITDA to total assets, estimated in the year prior to entering into a loan contract. **Leverage**-the ratio of the long-term debt to total assets, estimated in the year prior to entering into a loan contract. **Interest coverage**-the ratio of EBITDA to interest expense, estimated in the year prior to entering into a loan contract.

**Table 4: Loan pricing as a function of information asymmetry: clustering at the year level**

$$\text{Interest-rate-spread} = \beta_1 \text{Bid-ask-spread} + \beta_2 \text{Loan-size} + \beta_3 \text{Corporate-rating} + \beta_4 \text{Maturity} + \beta_5 \text{Revolver} + \beta_6 \text{Institutional} + \beta_7 \text{Purpose-restructuring} + \beta_8 \text{Performance-pricing-increase} + \beta_9 \text{Covenant-financial} + \beta_{10} \text{Number-of-lenders} + \beta_{11} \text{Public/Traded} + \beta_{12} \text{Firm-size} + \beta_{13} \text{Profitability} + \beta_{14} \text{Leverage} + \beta_{15} \text{Interest-coverage}$$

	Pred. signs	Total sample	Loans of publicly reporting borrowers
Bid-ask-spread ( $\beta_1$ )	+	20.080*** (3.47)	21.253*** (3.70)
Loan-size ( $\beta_2$ )	-	-27.511*** (1.48)	-84.882*** (26.40)
Corporate-rating ( $\beta_3$ )	+	2.742*** (0.32)	3.059*** (0.61)
Maturity ( $\beta_4$ )	+	0.051 (0.32)	0.070 (0.29)
Revolver ( $\beta_5$ )	?	-6.591 (9.40)	-13.494 (9.38)
Institutional ( $\beta_6$ )	+	55.210*** (11.40)	46.294*** (14.20)
Purpose-restructuring ( $\beta_7$ )	+	9.998 (6.67)	4.100 (10.91)
Performance-pricing-increase ( $\beta_8$ )	-	-61.454*** (2.13)	-58.767*** (3.73)
Covenant-financial ( $\beta_9$ )	?	23.350** (11.76)	26.721 (20.93)
Number-of-lenders ( $\beta_{10}$ )	-	-0.911* (0.47)	-1.119** (0.52)
Public / Traded ( $\beta_{11}$ )	-	-17.730*** (5.91)	-26.978** (13.37)
Firm-size ( $\beta_{12}$ )	-	-	-24.776*** (1.38)
Profitability ( $\beta_{13}$ )	-	-	-296.63*** (86.30)
Leverage ( $\beta_{14}$ )	+	-	50.936*** (14.39)
Interest-coverage ( $\beta_{15}$ )	-	-	-0.067 (0.69)
Adj R-Sq		34.05%	37.34%
Number of observations		2,486	1,482
Number of clusters		6	6

Regressions include year and industry fixed effects. Standard errors are heteroskedasticity robust, clustered at the year level. Standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 1, 5 and 10 percent level, respectively.

Variables: For the definition of *Interest-rate-spread* and the explanatory variables, see Table 3.

**Table 5: Loan pricing as a function of information asymmetry: controlling for loan collateral**

$Interest - rate - spread = \beta_1 Bid - ask - spread + \beta_2 Loan - size + \beta_3 Corporate - rating + \beta_4 Maturity + \beta_5 Revolver + \beta_6 Institutional + \beta_7 Purpose - restructuring + \beta_8 Performance - pricing - increase + \beta_9 Covenant - financial + \beta_{10} Number - of - lenders + \beta_{11} Secured + \beta_{12} Public / Traded + \beta_{13} Firm - size + \beta_{14} Profitability + \beta_{15} Leverage + \beta_{16} Interest - coverage$

	Pred. signs	Total sample	Loans of publicly reporting borrowers
Bid-ask-spread ( $\beta_1$ )	+	16.845*** (3.29)	18.455*** (5.02)
Loan-size ( $\beta_2$ )	-	-20.182*** (3.50)	-59.605*** (22.59)
Corporate-rating ( $\beta_3$ )	+	2.250*** (0.58)	2.062** (0.82)
Maturity ( $\beta_4$ )	+	-0.545*** (0.20)	-0.502* (0.27)
Revolver ( $\beta_5$ )	?	-17.491*** (6.03)	-24.205*** (7.86)
Institutional ( $\beta_6$ )	+	50.724*** (7.38)	39.450*** (10.27)
Purpose-restructuring ( $\beta_7$ )	+	6.415 (6.57)	0.101 (8.43)
Performance-pricing-increase ( $\beta_8$ )	-	-58.313*** (6.00)	-60.808*** (7.13)
Covenant-financial ( $\beta_9$ )	?	-1.890 (9.19)	-4.092 (13.17)
Number-of-lenders ( $\beta_{10}$ )	-	-0.714*** (0.25)	-1.059*** (0.31)
Secured ( $\beta_{11}$ )	+	83.019*** (11.92)	93.494*** (14.26)
Public / Traded ( $\beta_{12}$ )	-	-7.543 (6.64)	-23.876** (11.64)
Firm-size ( $\beta_{13}$ )	-	-	-13.381** (5.66)
Profitability ( $\beta_{14}$ )	-	-	-231.55*** (64.44)
Leverage ( $\beta_{15}$ )	+	-	47.547*** (18.37)
Interest-coverage ( $\beta_{16}$ )	-	-	1.041 (0.69)
Adj R-Sq		39.21%	42.39%
Number of observations		1,739	1,130
Number of clusters		576	374

Regressions include year and industry fixed effects. Standard errors are heteroskedasticity robust, clustered at the firm level. Standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 1, 5 and 10 percent level, respectively.

Variables: *Secured*-an indicator variable taking the value of one if the facility is backed by collateral, zero otherwise. For the definition of *Interest-rate-spread* and the rest of the explanatory variables, see Table 3.

**Table 6: Loan pricing as a function of information asymmetry: controlling for loan rating**

$$\text{Interest-rate-spread} = \beta_1 \text{Bid-ask-spread} + \beta_2 \text{Loan-size} + \beta_3 \text{Loan-rating} + \beta_4 \text{Maturity} + \beta_5 \text{Revolver} + \beta_6 \text{Institutional} + \beta_7 \text{Purpose-restructuring} + \beta_8 \text{Performance-pricing-increase} + \beta_9 \text{Covenant-financial} + \beta_{10} \text{Number-of-lenders} + \beta_{11} \text{Public/Traded} + \beta_{12} \text{Firm-size} + \beta_{13} \text{Profitability} + \beta_{14} \text{Leverage} + \beta_{15} \text{Interest-coverage}$$

	Pred. signs	Total sample	Loans of publicly reporting borrowers
Bid-ask-spread ( $\beta_1$ )	+	30.505*** (8.40)	38.679*** (14.02)
Loan-size ( $\beta_2$ )	-	-7.793 (4.89)	-10.759 (34.33)
Loan-rating ( $\beta_3$ )	+	22.399*** (2.85)	21.667*** (3.89)
Maturity ( $\beta_4$ )	+	-0.420 (0.37)	-0.266 (0.37)
Revolver ( $\beta_5$ )	?	-17.139** (8.00)	-16.119* (8.85)
Institutional ( $\beta_6$ )	+	28.174** (12.96)	22.509* (13.39)
Purpose-restructuring ( $\beta_7$ )	+	8.821 (10.73)	2.496 (14.79)
Performance-pricing-increase ( $\beta_8$ )	-	-39.847*** (8.79)	-54.778*** (11.34)
Covenant-financial ( $\beta_9$ )	?	20.212* (12.44)	36.478* (18.67)
Number-of-lenders ( $\beta_{10}$ )	-	-0.909** (0.45)	-1.620*** (0.62)
Public / Traded ( $\beta_{11}$ )	-	-8.691 (9.01)	-13.980 (16.96)
Firm-size ( $\beta_{12}$ )	-	-	-3.689 (7.64)
Profitability ( $\beta_{13}$ )	-	-	-89.746 (78.87)
Leverage ( $\beta_{14}$ )	+	-	6.258 (29.34)
Interest-coverage ( $\beta_{15}$ )	-	-	0.574 (0.72)
Adj R-Sq		40.11%	47.79%
Number of observations		638	442
Number of clusters		267	175

Regressions include year and industry fixed effects. Standard errors are heteroskedasticity robust, clustered at the firm level. Standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 1, 5 and 10 percent level, respectively.

Variables: **Loan-rating**-the numerical equivalent of the S&P or Moody's loan rating. For the definition of **Interest-rate-spread** and the rest of the explanatory variables, see Table 3.

**Table 7: Loan pricing as a function of information asymmetry: controlling for rating discrepancy**

$Interest - rate - spread = \beta_1 Bid - ask - spread + \beta_2 Loan - size + \beta_3 Loan - rating + \beta_4 Maturity + \beta_5 Revolver + \beta_6 Institutional + \beta_7 Purpose - restructuring + \beta_8 Performance - pricing - increase + \beta_9 Covenant - financial + \beta_{10} Number - of - lenders + \beta_{11} Rating - discrepancy + \beta_{12} Public / Traded + \beta_{13} Firm - size + \beta_{14} Pr of itability + \beta_{15} Leverage + \beta_{16} Interest - coverage$

	Pred. signs	Total sample	Loans of publicly reporting borrowers
Bid-ask-spread ( $\beta_1$ )	+	32.809*** (12.23)	39.243** (17.84)
Loan-size ( $\beta_2$ )	-	2.546 (6.33)	23.749 (35.13)
Loan-rating ( $\beta_3$ )	+	22.710*** (3.60)	27.113*** (4.71)
Maturity ( $\beta_4$ )	+	-0.940* (0.49)	-0.682* (0.41)
Revolver ( $\beta_5$ )	?	-11.488 (9.03)	-1.322 (7.66)
Institutional ( $\beta_6$ )	+	28.489* (14.75)	33.979*** (10.76)
Purpose-restructuring ( $\beta_7$ )	+	4.633 (14.07)	-9.273 (11.37)
Performance-pricing-increase ( $\beta_8$ )	-	-29.464*** (8.72)	-39.168*** (11.91)
Covenant-financial ( $\beta_9$ )	?	18.370 (12.42)	35.786** (16.27)
Number-of-lenders ( $\beta_{10}$ )	-	-0.969* (0.54)	-1.659*** (0.57)
Rating-discrepancy ( $\beta_{11}$ )	+	14.551* (8.81)	16.997* (10.13)
Public / Traded ( $\beta_{12}$ )	-	-27.962*** (10.08)	10.496 (18.57)
Firm-size ( $\beta_{13}$ )	-	-	13.505 (9.11)
Profitability ( $\beta_{14}$ )	-	-	24.709 (101.8)
Leverage ( $\beta_{15}$ )	+	-	-6.286 (27.47)
Interest-coverage ( $\beta_{16}$ )	-	-	0.881 (0.71)
Adj R-Sq		41.37%	54.57%
Number of observations		417	279
Number of clusters		175	118

Regressions include year and industry fixed effects. Standard errors are heteroskedasticity robust, clustered at the firm level. Standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 1, 5 and 10 percent level, respectively.

Variables: **Loan-rating**-the numerical equivalent of the S&P or Moody's loan rating. **Rating-discrepancy**-the absolute difference between the S&P's and Moody's loan ratings. For the definition of **Interest-rate-spread** and the rest of the explanatory variables, see Table 3.

**Table 8: Loan maturity as a function of information asymmetry**

$$\text{Maturity} = \beta_1 \text{Bid-ask-spread} + \beta_2 \text{Loan-size} + \beta_3 \text{Corporate-rating} + \beta_4 \text{Corporate-rating-square} + \beta_5 \text{Institutional} + \beta_6 \text{Purpose-restructuring} + \beta_7 \text{Covenant-financial} + \beta_8 \text{Number-of-lenders} + \beta_9 \text{Firm-size} + \beta_{10} \text{Asset-maturity} + \beta_{11} \text{Asset-tangibility}$$

	Pred. signs	Total sample	Loans of publicly reporting borrowers
Bid-ask-spread ( $\beta_1$ )	-	-3.552*** (0.50)	-3.815*** (0.63)
Loan-size ( $\beta_2$ )	?	0.775 (0.61)	16.388*** (4.10)
Corporate-rating ( $\beta_3$ )	+	7.617*** (1.16)	6.841*** (1.27)
Corporate-rating-square ( $\beta_4$ )	-	-0.212*** (0.03)	-0.211*** (0.04)
Institutional ( $\beta_5$ )	+	17.492*** (0.82)	17.630*** (1.06)
Purpose-restructuring ( $\beta_6$ )	+	12.197*** (1.34)	4.679** (1.86)
Covenant-financial ( $\beta_7$ )	+	3.093** (1.22)	4.543** (1.60)
Number-of-lenders ( $\beta_8$ )	?	-0.024 (0.05)	0.102** (0.05)
Firm-size ( $\beta_9$ )	?	-	-2.926*** (0.78)
Asset-maturity ( $\beta_{10}$ )	+	-	0.124 (0.22)
Asset-tangibility ( $\beta_{11}$ )	+	-	1.670 (5.42)
Adj R-Sq		43.52%	47.67%
Number of observations		2,486	1,394
Number of clusters		749	419

Regressions include year and industry fixed effects. Standard errors are heteroskedasticity robust, clustered at the firm level. Standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 1, 5 and 10 percent level, respectively.

Variables: **Maturity**-the number of months between the facility's issue date and the date when the facility matures. **Bid-ask-spread**-an average bid-ask spread on the borrower's loans traded on the secondary loan market; reported as a percent of par. **Loan-size**-total sample: a logarithm of the facility's amount; sample of public borrowers: the ratio of the facility's amount to the borrower's total assets in the year prior to entering into a loan contract. **Corporate-rating**-the numerical equivalent of the S&P or Moody's senior debt rating. **Institutional**-an indicator variable taking the value of one if the loan's type is term loan B, C or D, zero otherwise. **Purpose-restructuring**-an indicator variable taking the value of one if the facility's primary purpose is Takeover, LBO/MBO or Recapitalization, zero otherwise. **Covenant-financial**-an indicator variable taking the value of one if the loan agreement imposes financial covenants, zero otherwise. **Number-of-lender**-number of participants in the loan syndicate (including the arranger). **Firm-size**-the size of the firm measured by a logarithm of the borrower's total assets in the year prior to entering into a loan contract. **Asset-maturity**-the weighted average of two ratios: the ratio of current assets to the cost of goods sold, and the ratio of net property, plant, and equipment to depreciation and amortization; these ratios are weighted by the relative size of current assets and net PPE, respectively. **Asset tangibility**-the ratio of net PPE to total assets, estimated in the year prior to entering into a loan contract.

**Table 9: Loan maturity as a function of information asymmetry: clustering at the year level**

$$Maturity = \beta_1 Bid - ask - spread + \beta_2 Loan - size + \beta_3 Corporate - rating + \beta_4 Corporate - rating - square + \beta_5 Institutional + \beta_6 Purpose - restructuring + \beta_7 Covenant - financial + \beta_8 Number - of - lenders + \beta_9 Firm - size + \beta_{10} Asset - maturity + \beta_{11} Asset - tangibility$$

	Pred. signs	Total sample	Loans of publicly reporting borrowers
Bid-ask-spread ( $\beta_1$ )	-	-3.552*** (0.29)	-3.815*** (0.32)
Loan-size ( $\beta_2$ )	?	0.775 (0.47)	16.388*** (3.10)
Corporate-rating ( $\beta_3$ )	+	7.617*** (0.60)	6.841*** (0.74)
Corporate-rating-square ( $\beta_4$ )	-	-0.212*** (0.02)	-0.211*** (0.02)
Institutional ( $\beta_5$ )	+	17.492*** (0.98)	17.630*** (0.99)
Purpose-restructuring ( $\beta_6$ )	+	12.197*** (1.15)	4.679* (2.48)
Covenant-financial ( $\beta_7$ )	+	3.093** (1.30)	4.543** (1.97)
Number-of-lenders ( $\beta_8$ )	?	-0.024 (0.06)	0.102** (0.04)
Firm-size ( $\beta_9$ )	?	-	-2.926*** (1.02)
Asset-maturity ( $\beta_{10}$ )	+	-	0.124 (0.23)
Asset-tangibility ( $\beta_{11}$ )	+	-	1.670 (2.99)
Adj R-Sq		43.52%	47.67%
Number of observations		2,486	1,394
Number of clusters		6	6

Regressions include year and industry fixed effects. Standard errors are heteroskedasticity robust, clustered at the year level. Standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 1, 5 and 10 percent level, respectively.

Variables: For the definition of *Maturity* and the explanatory variables, see Table 8.

**Table 10: Loan maturity as a function of information asymmetry: controlling for loan collateral**

$$Maturity = \beta_1 Bid - ask - spread + \beta_2 Loan - size + \beta_3 Corporate - rating + \beta_4 Corporate - rating - square + \beta_5 Institutional + \beta_6 Purpose - restructuring + \beta_7 Covenant - financial + \beta_8 Number - of - lenders + \beta_9 Secured + \beta_{10} Firm - size + \beta_{11} Asset - maturity + \beta_{12} Asset - tangibility$$

	Pred. signs	Total sample	Loans of publicly reporting borrowers
Bid-ask-spread ( $\beta_1$ )	-	-3.918*** (0.62)	-4.215*** (0.77)
Loan-size ( $\beta_2$ )	?	1.527** (0.66)	18.300*** (4.31)
Corporate-rating ( $\beta_3$ )	+	3.611** (1.44)	3.608** (1.62)
Corporate-rating-square ( $\beta_4$ )	-	-0.106** (0.04)	-0.124** (0.05)
Institutional ( $\beta_5$ )	+	16.673*** (0.86)	15.881*** (1.13)
Purpose-restructuring ( $\beta_6$ )	+	9.031*** (1.41)	2.952 (1.89)
Covenant-financial ( $\beta_7$ )	+	1.480 (1.75)	4.417* (2.34)
Number-of-lenders ( $\beta_8$ )	?	-0.046 (0.06)	0.079 (0.06)
Secured ( $\beta_9$ )	+	13.725*** (3.12)	12.382*** (3.63)
Firm-size ( $\beta_{10}$ )	?	-	-1.678** (0.84)
Asset-maturity ( $\beta_{11}$ )	+	-	0.140 (0.23)
Asset-tangibility ( $\beta_{12}$ )	+	-	1.815 (5.57)
Adj R-Sq		47.03%	49.02%
Number of observations		1,739	1,061
Number of clusters		576	353

Regressions include year and industry fixed effects. Standard errors are heteroskedasticity robust, clustered at the firm level. Standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 1, 5 and 10 percent level, respectively.

Variables: *Secured*-an indicator variable taking the value of one if the facility is backed by collateral, zero otherwise. For the definition of *Maturity* and the rest of the explanatory variables, see Table 8.

**Table 11: Loan maturity as a function of information asymmetry: controlling for loan rating**

$$\text{Maturity} = \beta_1 \text{Bid-ask-spread} + \beta_2 \text{Loan-size} + \beta_3 \text{Loan-rating} + \beta_4 \text{Loan-rating-square} + \beta_5 \text{Institutional} + \beta_6 \text{Purpose-restructuring} + \beta_7 \text{Covenant-financial} + \beta_8 \text{Number-of-lenders} + \beta_9 \text{Firm-size} + \beta_{10} \text{Asset-maturity} + \beta_{11} \text{Asset-tangibility}$$

	Pred. signs	Total sample	Loans of publicly reporting borrowers
Bid-ask-spread ( $\beta_1$ )	-	-3.972*** (1.04)	-4.406*** (1.54)
Loan-size ( $\beta_2$ )	?	0.751 (1.05)	13.509** (6.00)
Loan-rating ( $\beta_3$ )	+	7.562*** (2.91)	8.977** (4.24)
Loan-rating-square ( $\beta_4$ )	-	-0.242 (0.23)	-0.304 (0.25)
Institutional ( $\beta_5$ )	+	15.191*** (1.22)	14.310*** (1.46)
Purpose-restructuring ( $\beta_6$ )	+	6.583*** (1.74)	3.516 (2.42)
Covenant-financial ( $\beta_7$ )	+	4.744** (2.31)	7.439** (2.93)
Number-of-lenders ( $\beta_8$ )	?	-0.217 (0.14)	-0.011 (0.10)
Firm-size ( $\beta_9$ )	?	-	-2.620** (1.13)
Asset-maturity ( $\beta_{10}$ )	+	-	0.128 (0.17)
Asset-tangibility ( $\beta_{11}$ )	+	-	4.217 (7.51)
Adj R-Sq		42.84%	52.19%
Number of observations		638	409
Number of clusters		267	167

Regressions include year and industry fixed effects. Standard errors are heteroskedasticity robust, clustered at the firm level. Standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 1, 5 and 10 percent level, respectively.

Variables: *Loan-rating*-the numerical equivalent of the S&P or Moody's loan rating. For the definition of *Maturity* and the rest of the explanatory variables, see Table 8.

**Table 12: Loan maturity as a function of information asymmetry: controlling for R&D intensity**

$$Maturity = \beta_1 Bid - ask - spread + \beta_2 Loan - size + \beta_3 Corporate - rating + \beta_4 Corporate - rating - square + \beta_5 Institutional + \beta_6 Purpose - restructuring + \beta_7 Covenant - financial + \beta_8 Number - of - lenders + \beta_9 Firm - size + \beta_{10} Asset - maturity + \beta_{11} Asset - tangibility + \beta_{12} R \& D - intensity$$

	Pred. signs	Loans of publicly reporting borrowers
Bid-ask-spread ( $\beta_1$ )	-	-2.464** (0.97)
Loan-size ( $\beta_2$ )	?	15.956*** (5.42)
Corporate-rating ( $\beta_3$ )	+	6.921*** (1.29)
Corporate-rating-square ( $\beta_4$ )	-	-0.215*** (0.04)
Institutional ( $\beta_5$ )	+	16.982*** (1.49)
Purpose-restructuring ( $\beta_6$ )	+	3.461 (3.02)
Covenant-financial ( $\beta_7$ )	+	5.474** (2.16)
Number-of-lenders ( $\beta_8$ )	?	-0.115 (0.08)
Firm-size ( $\beta_9$ )	?	-3.315*** (0.92)
Asset-maturity ( $\beta_{10}$ )	+	0.670* (0.38)
Asset-tangibility ( $\beta_{11}$ )	+	-12.939 (7.79)
R&D-intensity ( $\beta_{12}$ )	-	-57.004* (32.68)
Adj R-Sq		45.66%
Number of observations		653
Number of clusters		206

Regressions include year and industry fixed effects. Standard errors are heteroskedasticity robust, clustered at the firm level. Standard errors are reported in parentheses. \*\*\*, \*\*, \* denote significance at the 1, 5 and 10 percent level, respectively.

Variables: **R&D-intensity** the ratio of R&D expenditures to sales, estimated in the year prior to a loan issue. For the definition of **Maturity** and the rest of the explanatory variables, see Table 8.