

Corporate Debt Maturity Profiles and Bank Loan Covenants

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Abstract

Should firms disperse their debt maturity dates or concentrate on their debts on a particular maturity? We examine a sample of U.S. bank loans from 2002 and 2016 and find that firms with a dispersed debt maturity structure have fewer covenant restrictions in their loan contracts. Less frequent use of covenant, however, does not seem to result borrowers' risk-taking. Dispersing debt maturity significantly reduces covenants after controlling for other debt features and the reduction effect is stronger when borrowers exposed rollover risk and in need of monitoring. This study highlights the dispersion in debt maturity structure mitigates the shareholder-creditor conflicts through lowering rollover risk and increasing monitoring power, resulting banks requiring less restrictive covenant structure in corporate loan contracts for monitoring and alleviating agency problems.

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1. Introduction

Empirical research suggests that debt maturity structure varies across firms and is linked to corporate policies and value. While debt maturity literature has focused on one particular dimension: the fraction of short-term debts in total debt outstanding, recent studies highlight the importance of dispersion in debt maturity structure (e.g., Choi, Hackbarth, and Zechner, 2017). In particular, some firms have maturity dates spread over time to achieve significant dispersion of maturity profiles; as such, they need to roll over existing or issue new debt with greater frequency and smaller offering size. In contrast, some firms structure their maturity dates closely to achieve a concentrated debt maturity structure.

Practitioners note that firms choose debt maturity profiles to mitigate rollover risk, which is the most commonly suggested determinant of debt maturity according to Servaes and Tufano's (2006) survey of chief financial officers (CFOs).¹ However, existing literature provides limited knowledge on whether and to what extent firms manage their debt maturity dispersion and its association with firm value. There is a handful of empirical evidence on the effects of debt maturity dispersion (e.g., Norden, Roosenboom, and Wang, 2016).² In this paper, we focus on this new dimension of a company's debt structure and examine the effect of corporate debt maturity dispersion on bank loan covenants.

The bank loan market has become the largest source of corporate financing in the last two decades and almost all bank loans are contracted with covenants (Christensen and Nikolaev, 2012).³ Covenants play an important role in loan contracting: Lenders require covenants to reduce information asymmetry or agency problems; at the same time, tighter covenant terms can lead to higher costs borne by borrowers, such as higher transaction costs resulting from more frequent refinancing and forgone profitable investment opportunities due to compliance with covenants.

¹ A few other recent examples include the 2010 CFO Forum and the 2013 Striking Facts reports by J.P. Morgan.

² In particular, they investigate whether firms manage rollover risk by having a dispersed bond maturity structure and find that spreading out bond maturity dates help issuers achieve better access and lower cost of financing, less financially constrained and lower stock return volatility.

³ For example, Khang, King, and Nguyen (2016) report that bank debt accounts for 56% of total debt outstanding for a typical U.S. company.

We hypothesize that loan contracts of borrowers with a dispersed debt maturity structure are likely to contain fewer covenant restrictions due to the following two channels. First, a dispersed debt maturity structure mitigates the agency problem associated with the rollover risk through which intense shareholder–debtholder conflicts motivate shareholders to default earlier, leading to a higher probability of default (He and Xiong, 2012a) (*the rollover risk hypothesis*). Second, a dispersed debt maturity structure indicates that debt issues mature at different points in time, resulting in a need for borrowers to access the debt markets frequently and consequently greater monitoring of these borrowers. The increased monitoring mitigates the agency problem in which shareholders exploit debt holders by engaging in more risky investments (Jensen and Meckling, 1976) (*the monitoring substitution hypothesis*). As covenants are designed to limit corporate behaviors that contribute to agency problems and/or to substitute for monitoring, we conjecture that a more dispersed debt maturity profile in borrowers’ existing debts incentivizes lenders to include fewer covenants.

Alternatively, He and Xiong (2012b) theorize that spreading out debt expirations across time enables firms to avoid the *simultaneous* coordination problem among maturing creditors, but exacerbate the *dynamic* coordination problem among maturing creditors and future creditors. This dynamic coordination problem arises through the mechanism that each maturing creditor faces the risk that the firm could fail during its next contract period if future maturing creditors choose not to roll over their debt contracts. To protect against the rollover risk caused by future creditors, each maturing creditor may choose not to roll over debts ahead of other future creditors even when the firm is fundamentally healthy. The dynamic coordination problem can lead to greater *future* rollover risk and greater investment uncertainty. Thus, banks are likely to demand more restrictive covenants in loan contracts for firms with a dispersed debt maturity structure to help reduce the creditor conflict problem (*the creditor-conflict hypothesis*). We conjecture that loan contracts of borrowers with a more dispersed debt maturity structure are more likely to contain greater covenant restrictions.

Motivated by these theoretical predictions, we provide the first empirical work investigating whether and how a firm’s debt maturity dispersion affects the terms of bank loan contracting. Using a sample of 5,674 loan contracts by U.S. public firms from 2002 to 2016, we find that lenders are less likely to include restrictive covenants

in loan contracts for borrowers with a dispersed debt maturity structure. The result is consistent with *the rollover risk hypothesis* and *the monitoring substitution hypothesis*. Our findings are economically significant: An increase in debt maturity dispersion from the 25th to the 75th percentile decreases the number of covenants by 10.9%, after controlling for borrower and loan characteristics, and other various effects.

We employ robust empirical frameworks by including in all regressions major characteristics associated with the borrower and loan contract, credit risk, and industry, bank and year fixed effects to control for the time-invariant and time-varying factors that may affect both the debt maturity structure and loan covenants. Moreover, we measure debt maturity dispersion in three ways. The primary measure of maturity dispersion is based on Choi et al. (2017), in which dispersion is estimated as the inverse of the maturity profile's Herfindahl index. The second measure is based on Norden et al. (2016), which is a modified version of the primary dispersion measure by taking into account time to maturity of each debt (i.e., maturity-weighted debt maturity dispersion measure).⁴ We develop the third measure by revising the primary measure to include outstanding debts issued prior to the current year instead of all existing debts. As debts issued prior to the current year are determined in the past, the revised measure is less likely to correlate with the firm's current risk characteristics, reducing the concern for endogeneity. Our results remain robust across dispersion measures and regression models with different controls.

Recent studies suggest that different types of financial covenants vary by how they constrain borrowers' actions and alleviate conflicts between borrowers and lenders (e.g., Chava, Kumar, and Warga, 2010; Demerjian, 2011; Christensen and Nikolaev, 2012). Investigating the effects of debt maturity dispersion on individual covenants, we find that loan contracts of dispersed firms contain fewer covenants that are associated with distress risk (*Negative Covenant*), are designed to provide *ex post* monitoring (*Performance Covenant*), and are related to liquidity risk.⁵ However, loans

⁴ This feature is conceptually important to capture debt maturity dispersion. For example, the maturity structure for a firm with two debts of equal amounts that mature in year $t + 1$ and $t + 2$ is different from a firm with two debts of equal amounts that mature in year $t + 1$ and $t + 10$. The latter case intuitively represents a more dispersed debt maturity structure.

⁵ Those covenants that require borrower to maintain a minimum level of liquidity and to ensure that its earnings do not drop below a given threshold, to use available cash flows for debt repayments, and more restrictions on alternative uses of cash such as capital expenditures and dividend payouts.

of these firms are more likely to include covenants that are designed to signal risk or to control *ex ante* agency problems (*Capital Covenants*). Therefore, the results provide confirmation for *the rollover risk hypothesis* and *the monitoring substitution hypothesis*.

We further explore how the covenant-reducing effect of a dispersed debt maturity structure differs by a borrower's bank dependence, financial constraint, and creditworthiness. The results suggest that the incremental advantage for a borrower spreading out its debt maturity dates is significantly stronger for firms that are bank dependence, financially constrained, or riskier – firms that are likely to have more severe rollover risk and stronger monitoring needs. We also explore whether banks demand less collateral or charge a lower rate to recognize the effect of a dispersed maturity structure. Our findings indicate that for borrowers with a more dispersed debt maturity, banks indeed impose less collateral requirements and charge lower interest rates, in addition to including fewer covenants.

The use of covenants is viewed as a way to restrict investments in risky projects; hence, firms with fewer loan covenants may become riskier during post-loan periods. We show that dispersed firms experience a decrease in risk over the three years after the loan is granted; thus, fewer covenant restrictions do not seem to lead to greater risk-taking behaviors. The results paint a consistent picture that a dispersed debt maturity structure helps mitigate the default probability induced by the rollover risk and shareholders' risk-taking incentives due to greater monitoring.

We conduct a number of robustness tests. We confirm that a dispersed debt maturity structure leads to a reduction not only in the frequency and but also in the strictness of covenants. We address the concern that our findings are driven by differences in various other debt characteristics. We employ a simultaneous equation model (SEM) estimation to reduce potential concerns about reverse causality and the simultaneous determination of loan covenants and debt maturity dispersion. Overall, we confirm the major finding that a dispersed debt maturity profile is negatively associated with loan covenants.

This study contributes to the existing literature in three ways. First, the study focuses on the effect of debt maturity dispersion, a topic that prior research has mainly explored theoretically (Choi et al., 2017). Norden et al. (2016) is the first empirical study on debt maturity dispersion, in which they find that spreading out the maturities of new bond issues reduces the cost of debt. Different from their papers, our study

examines how the maturity dispersion of outstanding debts affects the terms of bank loan contracts.

Second, we add to the extensive research on the link between debt and loan structures. Anantharaman, Fang, and Gong (2013) find that higher CEO debt-like compensation (i.e., inside debt) leads to lower promised yield and fewer covenants in a sample of loans originated in 2006-2008. Lou and Otto (2017) document that a more heterogeneous structure of debt sources incentivize lenders to include more covenants in bank loans. We analyze a new aspect of debt maturity structure (i.e., dispersion of debt maturities) and provide strong empirical evidence on its effect of reducing covenants.

Finally, prior studies suggest that debtholders face a trade-off between covenants and debt maturity under certain conditions. Costello and Wittenberg-Moerman (2011) suggest that lenders decrease the use of financial covenants and substitute them with shorter maturity that serves as a monitoring device. Different from their study, we focus on a new aspect of debt maturity structure: debt maturity dispersion, and show that banks perceive and recognize that a dispersed debt maturity structure decreases covenants through the channel of monitoring.

The study is structured as follows. Section 2 presents theoretical arguments on how a firm's debt maturity dispersion affects bank loan covenants. Section 3 describes the data and introduces three measures of debt maturity dispersion. Section 4 discusses our preliminary findings on the interplay between debt maturity dispersion and loan covenants. Section 5 conducts robustness tests and addresses endogeneity problems. Section 6 concludes.

2. Theoretical Motivation and Hypothesis Development

This section reviews literature that links a firm's debt maturity dispersion with lenders' perspective on bank loan contracting. We then develop several hypotheses on the effects of a dispersed maturity profile on covenant restrictions in loan contracts. These hypotheses include *the rollover risk hypothesis*, *the monitoring substitution hypothesis*, and *the creditor conflict hypothesis*.

2.1. Rollover Risk Hypothesis

A dispersed debt maturity structure indicates that firms diversify their debt rollover dates across time. Choi et al. (2017) argue in theory that firms with a dispersed debt maturity structure may mitigate their rollover risk because the structure allows firms to refinance only a small fraction of their total debt at any point and thus reduce liquidity risk of having to roll over large quantities of debt at the same time. This debt structure could be more beneficial if credit conditions worsen because multiple small asset sales are less costly than a single large sale. In contrast, firms with a very concentrated debt maturity profile (i.e., a single short-term debt claim or a single long-term debt claim) need to be rolled over, which carries a large rollover interest expense if credit conditions worsen. Further, they may be unable to refinance expiring debt externally in some states of the world and therefore need to inefficiently liquidate assets and/or forgo valuable investments.

He and Xiong (2012a) argue that rollover risk can be a source of credit risk, because it intensifies the shareholder–debtholder conflict, in which shareholders bear refinancing costs, resulting in insolvency, even if the value of the firm’s assets is higher than the insolvency threshold without rollover risk. Several empirical studies document the interplay between rollover risk and credit risk by increasing financing costs (Wang, Chiu, and King, 2017), or by downgrading S&P rating (Gopalan, Song, and Yerramilli, 2014). Demerjian (2011) explains the use of covenants influenced by uncertainty regarding credit risk and higher credit risk should arguably lead to more covenants in the loan contracts (Rauh and Sufi (2010)). If lenders perceive that a dispersed debt maturity structure mitigates bad consequences due to rollover risk and/or credit risk through rollover risk channel, lenders would require fewer covenants. We accordingly propose *the rollover risk hypothesis*:

Hypothesis 1a (*the rollover risk hypothesis*): A dispersed debt maturity structure lowers the number of covenant restrictions in loan contracts through the channel of mitigating rollover risk.

2.2. *Monitoring Substitution Hypothesis*

Jensen and Meckling (1976) argue that shareholders prefer investments in risky projects, because their payoffs increase when a firm’s volatility increases. However, debtholders (i.e., fixed income claimants) may be negatively affected because risky investments would increase the likelihood of a firm’s insolvency. A dispersed debt maturity structure might alleviate this asset substitution problem as

spreading out of maturing debts across different dates creates more opportunities for creditors to monitor firms through which firms' investment policies are subject to more frequent renegotiations and scrutiny. Hence, a dispersed debt maturity structure could be an effective monitoring tool that discourages borrowers' risk-taking motives.

Debtholder often includes restrictive covenants to mitigate manager or shareholder incentives to engage in value-reducing risk shifting (Smith and Warner, 1979). Graham, Li, and Qiu (2008) suggest that banks can attempt to enhance the efficiency of monitoring by using tighter contract terms. Costello and Wittenberg-Moerman (2011) argue that, in the wake of material internal control weaknesses, lenders decrease the use of financial covenants and substitute them with other monitoring devices, such as shorter maturity. Debt maturity dispersion through which firms' investments are frequently monitored by creditors, such that affording lenders additional monitoring capacity, and thus dispersed debt maturity may substitute the usage of covenants to monitor borrowers. Moreover Beatty, Liao, and Weber (2012) argue that public debtholders often delegate monitoring to private lenders. Therefore, banks are more likely to perceive debt maturity dispersion as monitoring device. We accordingly propose *the monitoring substitution hypothesis*:

Hypothesis 1b (*the monitoring substitution hypothesis*): A dispersed debt maturity structure lowers the number of covenant restrictions in loan contracts through the channel of enhancing monitoring efficiency.

2.3. Creditor Conflict Hypothesis

Contrary to *the rollover risk hypothesis* and *the monitoring substitution hypothesis*, a dispersed debt maturity structure could be costly. He and Xiong (2012b) argue that spreading out debt expirations across time enables firms to avoid the *simultaneous* coordination problem among creditors, but exacerbate *dynamic* coordination problem among maturing creditors and future creditors. This dynamic coordination problem arises through the mechanism that each maturing creditor faces the risk that the firm could fail during its next contract period if future maturing creditors choose not to roll over their debt contracts; to protect itself against the firm's future rollover risk caused by future creditors, each maturing creditor may choose not to roll over debts ahead of other future creditors even when the firm is still fundamentally healthy. Hence, this dynamic coordination problem may lead to greater future rollover risk and increase investment uncertainty. Banks may wish to pressure

firms to take a loan imposed more covenants as a way to have protections against this dynamic coordination problem. We thus propose *the credit conflict hypothesis*:

Hypothesis 2 (*the creditor conflict hypothesis*): A dispersed debt maturity structure increases the number of covenant restrictions in loan contracts through the channel of intensifying conflicts between maturing creditors and future creditors.

3. Data and Variables

3.1. Sample Construction

This study examines the extent to which a dispersed debt maturity structure affects lenders' incentives of covenant requirements on bank loans. We use the Capital IQ capital structure detailed data to calculate debt maturities that allow us to measure the degree of how a firm's existing debts spread out across different dates (i.e., debt maturity dispersion).⁶ The historical debt maturities and amounts reported in Capital IQ are based on the detailed information and footnotes provided in various SEC filings (e.g., the 10-K form). We provide the detailed process of data clean up and debt maturity construction in Appendix A. We investigate U.S. firms from 2002 to 2016, because the Capital IQ database only provides reliable information from 2002 and onward.

We perform the following sample screening process. First, we begin with COMPUSTAT sample that we exclude firms from highly regulated industries; including financial firms (standard industrial classification [SIC] codes of 6000-6999) and utilities (SIC codes of 4900-4949). We further remove (1) firm-years with missing or zero values for total assets; (2) firm-years with missing or zero total debt; and (3) firm-years with market or book leverage outside the unit interval (as in Lemmon, Roberts, and Zender (2008)). We then merge the resulting sample with Capital IQ. We collect bank loan data from the Dealscan LPC database that provides detailed information about covenants as well as other loan characteristics. We then

⁶ Capital IQ lists each component of debt in the firms' capital structures, including principal, maturity, and type of debt (i.e., bonds and bank notes, commercial papers, term loans, revolving loans, leases, trust preferred, and other). Therefore, our debt maturity data capture the precise maturities of all components of firms' capital structure. This allows us to provide economically meaningful interpretations of our estimates and to capture more cross sectional variations in the maturity structure of debt than the COMPUSTAT categories allow.

merge the resulting sample with the DealScan database using the conversion table provided by Chava and Roberts (2008). All firm-level variables are measured at the fiscal year-end, immediately before the origination of the loan contract. In addition, we make sure that the firm-level variables are only available for loans granted during the next year.⁷ Because of this merge process, the loan data in year 2002 are not fully represented, and thus we remove observations for this year.

To quantify the use of covenants, we simply count them by following the literature (Graham et al., 2008), Demiroglu and James (2010), Bradley and Roberts (2015)). We exclude contracts without covenant information from the analysis.⁸ This process generates our initial sample of bank loans. We require non-missing values of the main variables of interest (i.e., debt maturity dispersion variables, details provided in Section 3.2) and control variables (details provided in Section 4.2). All continuous variables are winsorized at 1% and 99% level to limit the impact of potential outliers. Our final sample contains 5,674 loan facilities and 1,465 unique firms.

3.2 Measures of Debt Maturity Dispersion

In this section, we present three variables that measure how spread out or diversified a firm's debt maturity profile is.

3.2.1. Benchmark Dispersion Measure

The primary measure is based on Choi et al. (2017), in which the dispersion of debt maturity is the inverse of the maturity profile's Herfindahl index. Specifically, let x_i denote firm j 's principal amounts maturing in each maturity bucket i , where the buckets are obtained by grouping debt maturities into the nearest integer years. We thus define ten one-year maturity buckets for maturities shorter than 10 years (i.e.,

⁷ For example, a firm has fiscal year-end accounting data (DATADATE item in COMPUSTAT) as 31 May 2010. This accounting information is available only for loans granted during the next year (i.e., from 1 June 2010 to 31 May 2011).

⁸ Christensen and Nikolaev (2012) argue that it is highly unlikely that bank loans do not employ covenants given that almost all private credit agreements rely on covenants. The absence of covenant data is therefore likely to indicate that DealScan was unable to obtain information on covenants. Accordingly, we exclude contracts with no recorded covenants.

bucket 1, ..., 10).⁹ We further define two five-year maturity buckets for maturities of 11 to 15 years and 16 to 20 years, respectively (i.e., bucket 11 and bucket 12), and a bucket for maturities longer than 20 years (i.e., bucket 13). We group each firm's debt maturities into these defined buckets and compute the fractions of amounts outstanding each year. The fraction of principal maturing in each maturity bucket is then given by $w_{j,t,i} = x_{j,t,i} / \sum_{i=1}^{13} x_{j,t,i}$. The concentration index of firm j 's debt maturity structure in year t , $HERE_{j,t}$, is therefore defined as:

$$HERE_{j,t} = \sum_{i=1}^{13} w_{j,t,i}^2 \quad (1)$$

The dispersion measure $Dispersion$ is then defined as the inverse of the Herfindahl index:

$$Dispersion \equiv 1/HERE \quad (2)$$

Intuitively, the more heterogeneous the maturity of outstanding debts is, the higher the $Dispersion$ is. We provide several examples to gain the concept of our benchmark debt maturity dispersion measure. For a firm that has a single outstanding debt, the firm has $Dispersion$ value equal to one. For another firm that has two outstanding debts with equal face value, the firm's $HERE$ is 0.5 and thus $Dispersion$ is two. Therefore, the firm with $Dispersion$ value of two has a more dispersed debt structure than the firm with $Dispersion$ value of one. A firm with all exiting debts grouping in one single maturity bucket has a perfectly concentrated maturity structure; a firm with thirteen equally sized debts in separate maturity buckets would exhibit a dispersion measure of 13 and the firm has a perfectly dispersed maturity structure.

To have a visual concept about $Dispersion$ measure, Figure 1 charts the ratios of debts maturing over thirteen maturity buckets for four firms with different values of $Dispersion$ in the fiscal year 2015. These firms are Mueller Water Products, Cubic Corp, Owens Corning, and Dover Corp and their dispersion values are one, two, four, and seven respectively. For example, Owens Corning with dispersion value of four in 2015 had five different debt maturities outstanding, ranging from shorter than 1 year (bucket 1) to longer than 20 years (bucket 13). More importantly, this graphical vision

⁹ Specifically, we define bucket 1 if the maturity of a debt is less than 1 year; bucket 2 if the maturity of a debt is between 1 and 2 year; bucket 3 if the maturity of a debt is between 2 and 3 year and so on. We define bucket 10 when the maturity of a debt is between 9 and 10 year. We further define two five-year maturity buckets for maturities of 11 to 15 years and 16 to 20 years, respectively (i.e., bucket 11 and bucket 12), and a bucket for maturities longer than 20 years (i.e., bucket 13).

on corporate maturity profiles clearly show that the more *Dispersion* a firm has, the more dispersed (or diversified) debts maturing across different dates.

3.2.2. Maturity-Weighted Dispersion Measure

Norden et al. (2016) propose a modified version of Choi et al.'s (2017) debt dispersion measure by taking into account how far the maturities of different debts are away from each other. This feature matters for capturing debt maturity dispersion. For example, the maturity structure for firms with two debts of equal amounts that mature in year $t + 1$ and $t + 2$ is different from firms with two debts of equal amounts that mature in year $t + 1$ and $t + 10$. The key difference between the two situations is how stretched out the years to maturity are. We construct this alternative measure (named *Dispersion_maturity_weighted*) as:

$$Dispersion_maturity_weighted_{j,t,i} = \frac{1}{\sum_{i=1}^{13} W_{j,t,i}^2 \cdot \frac{1}{|m_{j,t,i} - \bar{m}_{j,t}| + 1}} \quad (3)$$

Here, $|m_{j,t,i} - \bar{m}_{j,t}|$ is the absolute value of maturity deviation, which is the difference between the maturity (in years) of firm j 's principal amounts maturing in each maturity bucket i and the average years to maturity of all debts outstanding in year t . We obtain a firm's average debt maturity by taking a weighted average of debt maturity on outstanding debts, where the weight is the amount of debt.

3.2.3. Predetermined Dispersion Measure

The major endogeneity problem of our study is that debt maturity dispersion may be simultaneously determined with loan contracting terms or there may be unobserved risks or factors that affect both. To deal with this concern, we develop an alternative dispersion measure that deviates from our benchmark measure by computing Equation (2) on the outstanding debts that had existed prior to the current year. That is, this alternative measure exclude debts newly appeared in a given year. This strategy is line with the idea in Almeida et al. (2012), who use the ratio of long-term debt that matures in a year to total assets, instead of short-term debt, to mitigate the endogenous concern on the study of rollover risk, because unlike short-term debt, long-term debt is predetermined and less likely to be correlated with the firm's current risk characteristics. The outstanding debts that had existed prior to the current year are

determined in the past, and thus this dispersion measure is less likely to be correlated with the firm's current risk characteristics, leading to a less endogenous concern.

We now introduce the procedure of obtaining this dispersion measure. The advantage of using the Capital IQ database is that it provides the “unique identifier for each debt issue” (Item name in Capital IQ is *COMPONENTID*). For a given firm, any outstanding debt that has an identical *COMPONENTID* from year $t - 1$ to next year t indicates that the debt had appeared in year $t - 1$, and still existed in year t . Therefore, we are able to discriminate outstanding debts whether they are new debts in year t or not. For a given firm and in year t , we eliminate outstanding debts identified as new debts and compute Equation (2); we name it *Dispersion_predetermined*.

3.3 Summary Statistics

Table 1 documents summary statistics for debt structure variables, firm characteristics and loan characteristics. *Dispersion* (our benchmark debt maturity dispersion measure) displays mean value of 2.52, the standard deviation of 1.63, and interquartile range is 1.99, suggesting significant variation in this debt maturity dispersion across firms.¹⁰ The first quantile of *Dispersion* is closer to one, indicating about a quarter of the sample observations have a perfectly concentrated debt maturity structure. Moreover the median value and the third quartile value is about 2 and 3.16 respectively, indicating that firms clearly do not appear to completely spread out their debt maturity dates (as they would have *Dispersion* of 13). To have insights of whether there is heterogeneity of maturity dispersion for firms with similar “average debt maturity,” Figure 2 plots distribution of *Dispersion* across terciles of the average debt maturity identified as short, intermediate, and long maturity groups. These distributions clearly indicate that there is a remarkable heterogeneity of maturity profile in each category.

As for loan characteristics, a loan on average contains more than 4 covenants. There is also a significant variation on the number of covenants; the first quartile is 2 and the third quartile is 6.

¹⁰ Choi et al. (2017) present that, on average, firms typically issue debt into 2.02 distinct maturity bins. Different from Choi et al. (2017), which they measure a firm's debt maturity dispersion specifically on bonds, our dispersion variable is computed on all outstanding debts of existing in a firm's balance sheet.

4. Empirical results

This section begins with a univariate analysis on examining the effect of debt maturity dispersion on the number of covenants imposed in bank loans. We then conduct multivariate analysis, as well as a number of additional evidence to further pin down which hypothesis (i.e., *the rollover risk hypothesis*, *the monitoring substitution hypothesis*, and *the creditor conflict hypothesis*) explains the effect.

4.1. Univariate Analysis of Loan Covenants and Maturity Dispersion

In Table 1 we compare the number of covenants between the two groups of firms with dispersed and concentrated debt maturity structure, which is classified based on the median of sample distribution on variable *Dispersion*. We find that firms with dispersed (concentrated) debt maturity structure have on average 3.92 (5.02) covenants; the difference is about one covenant and statistically significant at the 1% level. This preliminary finding suggests that spreading out debt maturity profile benefits borrowers from enjoying fewer covenant restrictions. This evidence is consistent with the risk mitigation story (i.e., *the rollover risk hypothesis* and *the monitoring substitution hypothesis*), but is not consistent with the prediction of *the creditor conflict hypothesis*.

Based on the comparison between firms with and without dispersed debt maturity structure, we find that dispersed firms significantly are larger, have more tangible assets, have less volatile cash flow, use more financial leverage and have lower market-to-book values than concentrated firms. There is no significant difference between these two types of firms in terms of profitability and distance-to-default (a commonly used credit risk indicator). These results indicate that dispersed firms are not necessary to be financially stronger firms or firms with more growth opportunities – both lead to contract the fewer charge of covenant restrictions. Therefore, this univariate comparison biases against *the rollover risk hypothesis* and *the monitoring substitution hypothesis*. The fact that we find evidence supporting these hypotheses (details presented in the following section) is thus more credible.

Table 2 provides Pearson correlations between our measures of debt maturity dispersion and the number of covenants. The correlations among three measures of dispersion are between 0.59 and 0.80, indicating that these variables are not identical and complement each other. More importantly, all three dispersion variables are

negatively correlated with the number of covenants, confirming the above comparative analysis that spreading out debts maturities is beneficial to reduce covenant restrictions. These correlations range from -0.33 to -0.36 ; the magnitude is mostly larger than the correlations between other firm characteristics and the number of covenants, suggesting that debt maturity dispersion is likely an important factor affecting the lenders' decisions on covenants.

4.2. Effect of Debt Maturity Dispersion on Loan Covenants

We conduct a multivariate regression analysis to examine whether the covenant-reduction effect of debt maturity dispersion remains after controlling for many other factors that could also affect the imposition of covenants on bank loans. To do that, we employ the following Poisson regression model:

$$\text{Number of Covenants} = f(\text{debt maturity dispersion measure, firm characteristics, loan characteristics, macroeconomic factors, credit rating dummies, bank fixed effects, industry fixed effects, and year fixed effects}). \quad (4)$$

In Equation (4), the dependent variable is the number of covenants in a given loan contract and the main variable of interest is debt maturity dispersion in the borrowing firm's existing debt, measured at the end of the fiscal year that precedes the date on which the new loan is granted. We control for borrower characteristics that are also measured at the fiscal year end before the origination of the loan contract and loan characteristics. Both borrower and loan characteristics are motivated by prior empirical studies and theoretical works on bank loan contracting (e.g., Graham et al., 2008; Bradley and Roberts, 2015). Specifically, we consider firm size (log assets), market-to-book value, leverage, profitability, tangibility, cash flow volatility, and distance-to-default.¹¹ As for loan characteristics, we consider loan price (all-in-drawn

¹¹ We expect a negative relation between covenants and firm size because larger firms are less opaque and have lower default risk compared with smaller firms. Firms with more growth opportunities (high market-to-book value) are expected to have few covenants because these firms seek to preserve flexibility by including fewer restrictive covenants in their financial contracts (Nash, Netter, and Poulsen, 2003). Tangible assets provide more satisfactory protection for debtholder wealth in the event of default, and firms with higher tangibility are expected to have fewer covenant restrictions. Firms with higher leverage, cash flow volatility, and default risk (i.e., lower distance-to-default) have more

spread), loan size, and loan maturity.¹² Loans that use performance-based pricing may enjoy more favorable terms than those without such a clause, and hence we include a dummy variable that takes the value of one for loans with performance-based pricing otherwise zero. We include loan type and purpose dummies in our model. We also control for macroeconomic factors (credit spread and term spread), credit rating dummies, bank fixed effects, industry fixed effects (categorized by 1-digit SIC code) and year fixed effects in our model.¹³ In all regressions, we report robust *t*-statistics that adjust for clustering at the borrowing firm level, aiming to deal with possible regression result bias due to cross-sectional heteroscedasticity and within-firm serial correlations. Variable definitions are reported in Appendix B.

Table 3 presents the Poisson regression results. The estimated coefficient of *Dispersion* is negative and highly significant at the 1% level in regression models without or with borrower and loan characteristics controls (Column 1 and 2). These results provide robust evidence that corroborates our preliminary finding that a dispersed debt maturity structure benefits borrowers from a lower imposition of covenants in a loan contract.

covenants because lenders impose more covenant restrictions on high credit risk firms. Profitable firms are associated with more covenants as suggested in Graham et al. (2008).

¹² Bradley and Roberts (2015) note that few previous empirical studies examined the promised yield in the context of investigating covenants, despite its obvious statistical and economic importance. The relation between the price and covenants of loan contracts may be ambiguous. On the one hand, this variable is expected to be negatively related to covenant because of the loan term trade-off hypothesis – creditors require more loan spreads in exchange for fewer covenants. On the other hand, creditors would demand both higher loan spreads and covenants on poor-credit firms. Loan maturity and covenant intensity are expected to be positively related, possibly because more covenants are required to control potential agency problems arising from longer-term debt (Graham et al., 2008).

¹³ Prior studies consider that credit spread and term spread are good proxies of macroeconomic conditions (e.g., Graham et al., 2008). In line with the literature, we measure credit spread as the difference between the yields of BAA and AAA corporate bonds and term spread as the difference between the yields of 10-year Treasury bonds and 2-year Treasury bonds. Including bank fixed effects is because we cannot rule out the possibility that unobserved heterogeneity among lenders has influenced our results. For example, Paligorova and Santos (2016) suggest that banks that rely on wholesale funding tend to offer shorter maturity loans. In line with Goss and Roberts (2011), we classify the administration agent in each deal as the lead bank in the syndicate and identify the ultimate parents of each lead bank. Then, we retain banks with more than 10 loans in our sample and create dummies that reflect these identified banks.

Regarding the economic magnitude of the estimated effect, the Poisson coefficient on *Dispersion* can be interpreted as semi-elasticities, i.e., the marginal effect of *Dispersion* is equal to the reported coefficient times the expected value of the number of covenants. In Column 1, the result indicates an increase in the *Dispersion* from the 25th to the 75th percentile of the sample distribution decreases the number of covenants in a bank loan by 21.9% – relative to the sample average of 4.47 covenants – after controlling for macroeconomic influence, year fixed effects, industry fixed effects, and bank fixed effects.¹⁴ After additionally controlling for firm and loan characteristics (see Column 2), our result indicates an increase in the *Dispersion* from the 25th to the 75th percentile of the sample distribution decreases the covenant index by 10.9%.

Next, we consider other two dispersion measures. We repeat these analyses by replacing *Dispersion_maturity_weighted* – the measure that complements our benchmark measure by taking into account how far the maturities of different debts are away from each other or *Dispersion-predetermined* – the measure that is designed to mitigate endogeneity concern by measuring *Dispersion* using only the outstanding debts that had existed prior to the current year. The coefficients of these dispersion variables remain negative and highly significant at the 1% level (Column 3 and 4). Thus the empirical results are qualitatively unaffected by these alternative dispersion definitions.¹⁵

As for control variables, the estimated coefficients are generally consistent with expectations. That is, the results show a negative relation between covenants and firm size, market-to-book value, tangibility and distance-to-default, a positive relation between covenants and leverage and profitability (not significant). The coefficient on cash flow volatility is negative in two regressions; although it is contrary to the expectation, it is barely significant and the Pearson correlation between covenants and cash flow volatility is significantly positive (0.12 in Table 2). The coefficients of loan characteristics are also consistent with the findings in Bradley and Roberts (2015) and

¹⁴ The detailed calculation is as follows. The difference between the 25th and the 75th percentile is $(3.16 - 1.17) = 1.99$. The estimated coefficient is -0.11 . Therefore, the economic magnitude is $1.99 \times (-0.11) = -21.9\%$.

¹⁵ Using alternative dispersion measures, the economic impact of is also substantial. Our result indicates *Dispersion-predetermined* (*Dispersion_maturity_weighted*) increases from the 25th to 75th percentile of the sample distribution decreases the average number of covenants by 11.6% (3.8%).

Chava, Wang, and Zou (2016). That is, loan spread is significantly positive; the size of the loan does not appear to have an effect on the number of covenants, a positive association between the maturity of a loan, and a highly significant positive relation between performance pricing and covenants.

In sum, our results suggest that a dispersed debt maturity structure leads to a lower charge of including covenants. It supports the predictions of *the rollover risk hypothesis* and *the monitoring substitution hypothesis*, but is not consistent with the prediction of *the creditor conflict hypothesis*.

4.3. Effect of Debt Maturity Dispersion on Different Types of Covenants

In the above analysis, we examine the effect of debt maturity dispersion on the “total number of covenants.” That is, we treat covenants as a homogenous class of contractual provisions by following many of previous studies. However, recent studies have highlighted that financial covenants play different roles in how they constrain borrowers’ actions and alleviate conflicts between borrowers and lenders (e.g., Chava et al., 2010; Demerjian, 2011; Christensen and Nikolaev, 2012). This motivates us to further investigate heterogeneous effects of debt maturity dispersion on different types of covenants.

4.3.1. Negative, Performance, and Capital Covenants

Christensen and Nikolaev (2012) category covenants into three mutually exclusive groups: *Negative covenants*, *Performance covenants*, and *Capital covenants*.¹⁶ *Negative covenants* are negative pledges to restrict managerial actions and guarantee assets are available to creditors if a debtor defaults (e.g., Excess cash flow sweeps, maximum capital expenditure, etc.). *Performance covenants* are based on measures of borrowers’ operating performance or efficiency and are designed to act primarily as “trip wires” that facilitate the contingent allocation of control to creditors under violation, providing creditors with an option to restrict managerial actions in states characterized by poor economic performance, which mitigate *ex post* debtholders-shareholders conflicts (e.g., minimum EBITDA, minimum interest coverage, etc.). *Capital covenants* require borrowers to maintain certain levels of capital and are designed to prevent borrowers from expropriating lenders’ wealth that

¹⁶ The detailed information on classifying these different covenant variables is provided in Appendix B.

controls for *ex ante* agency problems by making the value of shareholder stakes sensitive to managerial actions, which reduce the need for debt holder interference with managerial actions (e.g., minimum current ratio, maximum leverage ratio, etc.). We also measure the covenant mix: P/C = the number of *Performance covenants* / the number of *Capital covenants* to proxy for the extent to which a contract relies on *Performance covenants* versus *Capital covenants*. As Christensen and Nikolaev (2012) highlighted, given that *Performance covenants* serve to signal a deterioration in borrowers' health before the onset of financial distress, but *Capital covenants* do not. The P/C ratio is particularly important because this ratio captures the timely distress risk of a firm. This suggests that, in our setting, we should focus on negative covenants, performance covenants, and P/C ratio as they work together with the covenants that mitigate borrowers' credit risk and ex-post creditors' monitoring costs.

We begin by classifying each covenant into one of these three categories and for each loan contract in our sample, we then count the number of covenants within each category. We then re-estimate our baseline regression on these categories of covenants by replacing the total number of covenants with *Negative covenants*, *Performance covenants*, *Capital covenants*, and P/C ratio. Table 4 presents the results. All regressions are specified as in Equation (4) that includes controls on borrower characteristics, loan characteristics, credit rating dummies, bank fixed effects, industry fixed effects, year fixed effects, and macroeconomic factors. To conserve space, we do not report the coefficients on control variables.

The estimated coefficient of *Dispersion* is negative and statistically significant in the regressions where dependent variables are *Negative covenants*, *Performance covenants*, or P/C ratio (Column 1, 2, and 4). The results indicate a mitigation effect of debt maturity dispersion on those covenants that are associated with negative pledges and timely distress risk.¹⁷ Interestingly, we find that the coefficient of *Dispersion* is positive and significant in the *Capital covenants* regression (Column 3). It suggests that spreading out debt maturity increase those covenants that are designed to require borrowers to maintain certain levels of capital.

¹⁷ *Performance covenants* are costly for borrowers because such covenants allow early lender interference with managerial actions (Aghion and Bolton, 1992; Gigler et al., 2009). Our finding that the benefit of spreading out dates of debts to reduce Performance covenants is thus meaningful for firms attempting to be less constrained by ex post lenders' interference in managerial actions.

Taken together, the results on studying various covenants suggest that firms with a dispersed debt maturity structure are charged fewer covenants that are associated with distress risk and that are designed to provide *ex post* monitoring (i.e., *Negative covenants* or *Performance covenants*). Therefore, the results provide more robust evidence suggesting that diversifying debt maturity dates substitute for restrictive covenants for monitoring purposes, which is consistent with *the rollover risk hypothesis* and *the monitoring substitution hypothesis*, but is not consistent with the prediction of *the creditor conflict hypothesis*.

4.3.2. Liquidity Risk Related Covenants

Lou and Otto (2017) identify covenants dependent on their association with liquidity risk. We follow their work and classify each covenant into four categories: (1) *Minimum Liquidity Requirements* – specify minimum thresholds for financial ratios such as the borrower's interest coverage or current ratio); (2) *Cash Flow Sweeps* – prescribe that the proceeds from certain activities (e.g., asset sales or equity issuances) be used to repay the loan); (3) *EBITDA, Capex, and Dividend Restrictions* – specify minimum EBITDA thresholds or restrict capital expenditures or dividend payouts; and (4) *Leverage and Net Worth Restrictions* – limit the borrower's leverage or mandate a minimum amount of net worth.¹⁸ We then count the number of covenants within each category and re-estimate our baseline regression in which we replace the total number of covenants with these various types of covenants. The key concept on this classification is that the covenants on the categories (1), (2), and (3) are liquidity-risk-related covenants, whereas the covenant on the category (4) is not.

Table 4 presents the regression results. The estimated coefficients of *Dispersion* are negative and statistically significant at the 1% level across all three liquidity risk related covenants (Columns 5, 6, and 7), but it is not significant in the regression where the dependent variable is non-liquidity-risk-related covenant (Column 8). Therefore, we find fewer covenants that oblige the borrower to maintain a minimum level of liquidity and to ensure that its earnings do not drop below a given threshold, to use available cash flows for debt repayments, and more restrictions on alternative uses of cash such as capital expenditures and dividend payouts. At the same time, we do not find a decrease in leverage restrictions and net worth

¹⁸ A list of all covenants considered in our analysis is provided in Appendix B.

requirements - covenants that are arguably less suitable to mitigate the risk of a liquidity default. The results provide further evidence supporting *the rollover risk hypothesis* that a dispersed debt maturity reduces covenants through the channel of mitigating rollover risk.

In sum, we show that a dispersed debt maturity structure affects covenants in different ways. Dispersed firms experience fewer *Negative, Performance* covenants, and liquidity risk related covenants. The results further confirm to *the rollover risk hypothesis* and *the monitoring substitution hypothesis*.¹⁹

4.4. Cross-Sectional Analysis

We have shown that a firm can benefit from a dispersed maturity structure because such policy mitigates a firm's restrictions on covenants. In this section, we conduct cross-sectional tests to explore how this benefit differs conditional on a borrower's bank dependence, financial constraint, and creditworthiness.

Wang et al. (2017) documents that bank-dependent firms are more exposed to rollover risk and lenders charge larger interest payments because of it. Moreover, banks have concentrated ownership with respect to the syndicated loans they issue, allowing for better dynamic coordination between maturing and future creditors, which is against the covenants-increasing prediction based on *the creditor-conflict hypothesis*. We therefore predict that bank-dependent firms should exhibit the highest marginal benefits if they succeed in building up a well-spread debt maturity structure – the structure that is supposed to reduce rollover risk. Next, we explore how results vary with borrower's condition on financial constraints. Norden et al. (2016) argue that firms could obtain availability of external financing by having a dispersed debt maturity structure. We thus predict that financially constrained borrowers should benefit more if their maturity structure becomes more dispersed. Finally, we investigate whether the effect of dispersion depends on a borrower's creditworthiness. Prior research suggests that debtholder-shareholder conflicts vary with the borrower's creditworthiness and in particular, lower quality firms suffer more severe debtholder-shareholder conflicts when rolling over debts (Billett, King, and Mauer, 2007; Wang,

¹⁹ We also repeat the above analysis by using other two dispersion measures (i.e., *Dispersion_maturity_weighted* and *Dispersion_predetermined*) and find that our conclusion inference does not change. We report results in Online Appendix Table OA1 and Table OA2.

Chiu, and King, 2017). We predict that the benefit of managing debt structure toward to be dispersed is stronger for riskier firms than healthier firms.

To examine these predictions, we define a set of indicator variables: (1) *High Bank Debt Percent* that takes the value one if a firm's bank debts to total debt ratio is larger than the sample median, (2) *High KZ index* that takes the value one if a firm's Kaplan-Zingales Index is larger than the sample median,²⁰ (3) *High Leverage (Low Distance-to-Default or Low Altman's Z-score)* that takes the value one if a firm's leverage (distance-to-default or Altman's Z-score) is larger (smaller) than the sample median, suggesting that the firm's default risk is high.²¹ A borrower's status on credit rating could affect our results because credit ratings reflect not only a firm's dependence on bank debts²² but also its credit quality. We thus examine how the effect of debt maturity dispersion on covenants differs for firms that do not have ratings (unrated firms), firms with ratings below BBB (speculative grade firms), and firms with ratings above BBB (investment grade firms). We define two indicator variables on this analysis: *Unrated (Speculative Grade)* that the value one if a firm has no rating (speculative grade) otherwise zero.

We include interaction terms between *Dispersion* and each indicator variables and the indicator variable itself. We then estimate OLS regressions, rather than Poisson regressions, because the interaction effect in non-linear models is not, in general, equal to the coefficient estimate or marginal effect of the interaction term (Ai and Norton, 2003). Table 5 presents the results. All regressions present that the interaction terms are negative and statistically significant, confirming our predictions that the reduction effect of a dispersed maturity profile on the number of covenants is stronger for firms that are bank dependent, are financially constrained, have low credit quality, have no ratings or speculative grade ratings. However, there is no evidence in the group of investment grade firms (Column 6). The estimated coefficients of these indicator variables are positive and statistically significant; this is expected because these indicators are associated with borrowers' weak financing situation.

²⁰ KZ index (Kaplan and Zingales, 1997) is widely employed in the literature as firm-specific and time-varying measure of financial constraints. A higher KZ index indicates that the firm is more financially constrained.

²¹ Distance-to-Default and Altman's Z-score are inversely associated with credit risk.

²² For example, Chava and Purnanandam (2011) suggest that rated firms are likely to be less bank-dependent as they have access to public debt markets.

In sum, our finding suggests that having a dispersed debt maturity structure benefits all firms from reducing the covenant restrictions. However the incremental advantage for borrowers spreading out their debt maturity dates is significantly stronger for firms that are bank dependence, financially constrained, or riskier – those firms likely face more severe rollover risk and require more monitoring needs. This evidence thus further supports *the rollover risk hypothesis* and *the monitoring substitution hypothesis*.

4.5. Other Loan Contracting Terms

Covenants are but one mechanism by which lenders can constrain borrowers' behaviour of ex ante risk of having financed a poor project or ex post risk shifting by management. Banks could substitute restrictive covenants for other tighter loan contracting terms. Here we explore whether banks use collateral or price to recognize the beneficial effect of a dispersed debt maturity structure.

Economic theory largely explains collateral as a method of reducing *ex post* incentive problems (Berger, Frame, and Ioannidou, 2011) and creditors use collateral as a substitute for screening and monitoring efforts (Manove, Padilla, and Pagano, 2001). If lenders recognize that a spreading out debt maturity profile helps mitigate borrowers' risk-taking incentives or enhance lenders' monitoring incentives, we should expect that a dispersed debt profile decrease the inclusion of collateral in loans.

To test this prediction, we collect data from LPC DealScan and create a dummy variable, *Collateral (1/0)* that takes one if a loan contract includes collateral restriction otherwise 0. We then run a logistic regression that regress *Collateral (1/0)* on debt maturity dispersion and all control variables used in the main analysis. Column 1 of Table 6 reports that the coefficient of the dispersion variable is negative and highly significant. Interestingly, when we investigate how the effect of dispersion on collaterals differs conditional on credit ratings, the negative association between debt maturity dispersion and the incidence of collateral is incrementally strengthened for firms that lack of ratings (see Column 2 of Table 6).

Banks could also adjust price of loans to compensate their risk exposure on borrowers. However, unlike collateral, which we have a clear prediction on the effect of debt maturity dispersion, economic theory suggests that a dispersed debt maturity profile could affect bank loan price in opposite ways. On the one hand, Choi et al. (2017) argue that a firm with a very concentrated debt structure is costly in the

presence of rollover risk, in which the firm may be unable to refinance expiring debts or even if the firm could refinance the refinancing cost should be very high. Darst and Refayet (2017) also suggest that a concentrated maturity profile results in either higher risky long-term borrowing costs or higher risky short-term rollover costs because the firm must raise capital from additional capacity constrained investors. On the other hand, Choi et al. (2017) argue that a highly dispersed debt may be also costly. If a company's debt is fragmented into many small debt issues, secondary market liquidity for these securities will be poor, leading investors to demand higher yields. Hence, it is worth investigating the above-mentioned ambiguous theoretical prediction with an empirical study.

We measure bank loan cost by using loan spread that is defined as the basis points a borrower pays in excess of the London Interbank Offered Rate (LIBOR) for each dollar drawn down (i.e., all-in-drawn spreads). We also examine the price paid by corporations to guarantee access to liquidity from banks (i.e., all-in-undrawn fees). Table 6 presents the OLS regression results with dependent variables on bank loan prices and with the same set of firm, loan, bank, and macroeconomic controls as in Table 3. The estimated coefficients of dispersion are negative but only significant in the case of all-in-undrawn fees (Column 3 and 5). We further examine this effect on models that discriminate firms with different ratings (Column 4 and 6), the negative association between debt maturity dispersion and loan costs is significant only for unrated firms, indicating the reduction of loan spreads matters more for unrated firms.

In sum, we find that banks not only require fewer covenants, but also demand less collateral and lower interest expenses (both all-in-drawn and all-in-undrawn fee) to reflect their perceptions on the rollover risk reduction or monitoring substitution role of a dispersed debt maturity structure. This beneficial effect matters most for unrated firms. Given that unrated firms are commonly viewed to expose more rollover risk and have monitoring needs, the results provide further confirmation on *the rollover risk hypothesis* and *the monitoring substitution hypothesis*.

4.6. Effect of Debt Maturity Dispersion on Post-Loan Risk

The use of covenants is viewed as a method of forcing the manager to avoid risky strategies. Firms with fewer covenant restrictions in loan contracts could become riskier during post-loan periods. Put differently, if we observe debt maturity

dispersed firms experience a significant decrease in post-loan risk; we have more robust evidence.

We examine the evolution of three firm-level risk metrics over a three-year window following the origination of bank loans. They are implied asset volatility and stock return volatility.²³ In this analysis, we aggregate our facility observations at the package level so that we can clearly assess each firm's ex post performance as an independent observation (see Engelberg, Gao, and Parsons, 2012; Houston et al., 2014). We present post-loan results in Table 7 and find that within the first three years after the loan origination, pre-loan dispersed firms experience a significantly negative change in asset or equity volatility (see Panel A and B), indicating those firms become less riskier.

Overall, our results imply that the less frequent use of covenant does not seem to result in more risk-taking by borrowers with a more dispersed debt maturity structure and in fact, we observe dispersed firms experience decreased risk over the three years after the loan is granted. The results paint a consistent picture that a dispersed debt maturity structure helps reduce borrowers' risk and thus are charged fewer covenants.²⁴

5. Robustness Tests

So far, we conclude that new loans contain fewer covenants when the borrower's existing debt comprises multiple debts with different maturity. In this section, we conduct a set of robustness tests to corroborate this argument. First, we confirm that a dispersed debt maturity structure leads to a reduction not only in the

²³ We follow Bharath and Shumway (2008) in constructing the measure of asset volatility. We compute the standard deviation of a firm's excess stock returns over the 12 (24 or 36) - ahead months to measure stock return volatility.

²⁴ Armstrong, Gallimberti, and Tsui (2017) suggest that different types of covenants relate to borrowers' future risk-taking in opposite ways. *Capital covenants*, which restrict the *amount* of investment but not its "per dollar" riskiness, have a positive relation with borrowers' operating risk, while *Performance covenants*, which depend on the *outcome* of these investments, have a negative relation with borrowers' risk. Our previous results presents that a dispersed debt maturity structure increases *Capital covenants* but decreases *Performance covenants*. These findings suggest that maturity dispersed firms are likely to take greater risk and it is even more difficult for us to find a decreasing risk in the post-loan period.

frequency and but also in the strictness of covenants. Second, we address the concern that our findings are driven by differences in various other debt characteristics. Third, we employ a simultaneous equation model (SEM) estimation to reduce potential concerns about reverse causality and the simultaneous determination of loan covenants and debt maturity dispersion.

We also perform several additional robustness tests and to save space we present results in the Online Appendix. We show that our results are not sensitive to the difference of model specifications, which we run a Panel Poisson regression model with firm fixed effects; we take the logarithm of *Number of Covenants* as the dependent variable in the baseline regression model with/without borrowing firm fixed effects (see Table OA3). Our findings are also unchanged to using the package-level sample, which are meant to mitigate non-independent bias among multiple observations for a facility-level sample (Table OA4). Our findings are also robust to alternative sets of control variables by excluding loan spread variable from our model or including S&P 500 indicator (Table OA5).

5.1. Strictness of Covenants

One concern with the above results is that lenders may be agreeing to a decrease in covenants in exchange for greater restrictiveness of existing covenants. To address this issue, we construct a measure of covenant tightness following Vasvari (2006) and Callen et al. (2016). The slack for covenants that specify a “maximum” accounting number is computed as the percentage ratio, $(Required - Actual) / Required$, where *Required* is the accounting ratio or number that has to be maintained as per the bank loan, and *Actual* is the accounting ratio or number computed using current balance sheet or income statement information. For covenants that specify a “minimum” accounting measure, slack equals $(Actual - Required) / Required$. Slacks are inversely ranked relative to peers in SIC 3-digit industry-year on a scale from 0 to 1, so that the larger the number, the tighter the covenant. The tightness measure is computed as the sum of inverse rank of slacks across all covenants in the loan contract.

Due to data limitations, covenant slacks at the loan inception are available only for financial covenants (i.e., *Performance covenants* and *Capital covenants*) and the capital expenditure covenant (i.e., Maximum Capex). To make a better comparison among observations, the dataset used in this analysis excludes loans that do not have financial covenants or capital expenditure covenant. We construct the first

measure of covenants tightness (*Tight_Index_All*) to stand for the tightness of a loan. As previously argued, *Performance covenants* and *Capital covenants* play different role in terms of reducing agency costs, we also construct *Tight_Index_Performance* (*Tight_Index_Capital*), which measures particularly the tightness of *Performance covenants* (*Capital covenants*) for a loan.

We replace the number of covenants with the covenant strict index in loan covenant regression model and use the package-level sample. Table 8 presents the main results from the estimation of the regression by OLS with standard errors that are robust to heteroskedasticity and autocorrelation, clustered at the firm level. We observe that a dispersed debt maturity structure leads to a decrease in covenant tightness, not an increase; the decrease is also statistically significant across all maturity dispersion measures (Columns 1-3). When we examine tightness of *Performance* covenants, the decreasing-effect continues existing and the estimated coefficients show greater magnitudes and statistical significances (Columns 4-6). In contrast, we find a dispersed debt maturity structure increases the tightness of *Capital* covenants (Columns 7-9). These results are consistent with our main findings studying numbers of covenants.

Taken together, when borrowers spread out debt maturity profile, not only do private debt lenders require fewer covenants but also less tight covenants, especially for those covenants that associated with distress risk and *ex post* monitoring.

5.2. Other Debt Structure Characteristics

Being dispersed or being concentrated on debt maturity is one of dimensions profiling a debt structure. A potential concern, however, could be the difference in other debt structure features affect covenant restrictions – not difference in the debt maturity dispersion *per se*. To address this concern, we construct a set of debt structure variables: the short-term debts, the dependence on bank financing, the bank relationship, and the specialization on debt sources, and re-examine our key hypotheses by controlling for these variables.

First, *the monitoring substitution hypothesis* is built upon the argument that a dispersed debt maturity makes lenders to monitor a firm more frequently and through this channel lenders demand fewer covenants. Literature has documented that shortening debt maturity can also serve as an effective device for monitoring managers through frequent renegotiations of debt issuances (Brockman, Martin, and

Unlu, 2010; Cheng and Milbradt, 2012).²⁵ Since a dispersed maturity structure and a shorter debt structure both are predicted to motivate lenders imposing fewer covenants on loans, we re-examine our findings by controlling for borrowers' short-term debt feature. We consider three short-long maturity variables: average debt maturity, percentage of short-term debts to total debts (*Short-term debt percent*), and percentage of debts maturing in three years to total debts (*3-year debt percent*).

Second, a dependence on bank debts or a relationship with banks also likely affect covenants. Wang, Chiu and King (2017) document that default risk and rollover risk present a significant positive relation in firms dependent on bank financing. A firm has a close relationship with banks may obtain better deals; on the other hand, a tight bank relationship may lead to a hold-up effect through which banks may be more powerful to demand tighter deals. Hale and Santos (2009) argue that banks can hold up borrowers by charging higher interest rates, because they have private information. Therefore, we expect that lenders may require more covenant restrictions on bank-dependent firms or firms with bank relationship. We consider the proportion of bank debts to total debts as to the degree of a firm's bank debt dependence (*Bank debt percent*) and measure *Bank relationship* as an indicator variable equals one if a firm has borrowed from the same lead lender in the past five years and zero otherwise.

Third, we consider debt source specialization as Colla, Ippolito, and Li (2013) document there is a large variation on debt source specialization across firms and Lou and Otto (2017) find that debt source specialization reduces covenants. The reasoning is that borrowers and lenders consider the potential for creditor conflicts and coordination failure when deciding on the terms of the loan agreements. Multiple lenders (i.e. less debt source specialization) in a loan would intensify this conflict and lenders would demand more covenants for protection. We measure debt source specialization by following Colla, Ippolito, and Li (2013):

$$Debt\ Source\ Specialization = \left(\sum_{i=1}^7 s_i^2 - 1/7 \right) / (1 - 1/7) \cdot s_i \text{ for } i=1, 2, \dots, 7 \quad (5)$$

²⁵ Barnea, Haugen, and Senbet (1980) argue that shorter-term debt can reduce managerial incentives to increase risk. Further, Leland and Toft (1996) claim that short-term debt can reduce or even eliminate agency costs associated with asset substitution. An important insight from Stulz (2000) is that short-term debt provides creditors with "an extremely powerful tool to monitor management." Similarly, Rajan and Winton (1995) argue that short-term debt provides creditors with additional flexibility to monitor managers with minimum effort.

s_i is the fraction of debt type i in a firm's total debt. These debts refer to commercial paper, drawn credit lines, term loans, senior bonds and notes, subordinated bonds and notes, capital leases, and other debt, respectively. A larger value of this measure indicates a lower degree firms diversify their debt sources.²⁶

We then alternatively add these debt structure variables into our baseline regression (Equation 4) once at a time and run each regression. Table 9 presents the results. Throughout the table, the estimated coefficients of *Dispersion* are negative and statistically significant at 1% level. The results indicate that some other debt structure features do affect covenants, but the dispersion of debt maturity still provides additional and significant power in explaining the covenant-reduction effect.²⁷

As for other debt structure variables, the coefficients are significant on variables are in line with theoretical predictions. That is, the number of covenants and short-term debt proxies (average debt maturity, short-term debt percent, or 3-year debt percent) are negatively related, consistent with the theoretical argument that shorter debt structure that renders an effective monitoring tool could substitutes the use of covenants.²⁸ The covenant and bank dependence (or bank relationship) is positively related, consistent with the notion that lenders charge more covenant restrictions for bank-dependent firms because banks have hold up power. The covenant and debt source specialization is negatively related, consistent with the findings in Lou and Otto (2017), consistent with the notion that the coordination problem among creditors is less severe when a firm specializes in its debt financing sources.

²⁶ We provide Pearson correlations among these debt structure variables in Online Appendix (Table OA6). *Dispersion* is positively related to *average debt maturity* and *bank relationship*. In contrast, *Dispersion* is negatively related to *short-term debt percent*, *3-year debt percent*, *bank debt percent*, and *debt source specialization*. These results are expected since a firm has average longer debt structure is more likely to have both short-term and long-term debts, a firm more dependent on bank debts is more likely to restrict to borrower only short-term debts, and finally a firm use fewer types of debts is more likely to restrict on some particular maturity debts.

²⁷ The results remain robust when we use other alternative dispersion measures (i.e., *Dispersion_maturity_weighted* and *Dispersion_predetermined*) (see Online Appendix Table OA7 and Table OA8).

²⁸ This finding complements empirical finding in Billett, King, and Mauer (2007), in which they show short-term debts reduce covenants in corporate bonds.

In sum, we show that debt maturity dispersion remains its significant reduction effect on covenants after we take into account many other debt structure variables that potentially have impacts on covenants. The effect of *Dispersion* is also comparable in magnitude to the estimates reported in the main analysis.

5.3. Simultaneous Equation Model

The observed relation between debt maturity dispersion and the use of covenants could be due to unobserved differences in credit risk, resulting in endogeneity concerns. We have largely dealt with these concerns in our main analysis. First we consider alternative dispersion measure that is less associated with a firm's current risk and thus eases endogeneity concern (as described in Section 3.2.3). Second, we include dummy variables for all possible credit ratings that a borrower may have and control for many risk related variables in all regression.²⁹ Moreover, Choi et al. (2017) find that firms increase their maturity dispersion in the aftermath of a downgrade, indicating firms with higher credit risk could display higher levels of debt dispersion and higher credit risk should arguably lead to more covenants in the loan contracts (Rauh and Sufi, 2010). Hence, unobserved difference in credit risk should include a positive correlation between debt dispersion and the number of covenants and it would thus bias against us finding a negative relation between debt dispersion and the impositions of covenants.

In this section, we corroborate our findings with a simultaneous equation model (SEM) approach to reduce potential concerns about reverse causality and the simultaneous determination of loan covenants and debt maturity dispersion. To start, we expand the loan covenant model with the dispersion equation, defined as follows:

$$\textit{Number of Covenants} = f(\textit{debt maturity dispersion measure}, \textit{firm characteristics}, \textit{macroeconomic factors}, \textit{credit rating dummies}, \textit{industry and year fixed effects}). \quad (6)$$

$$\textit{Dispersion} = f(\textit{Number of Covenants}, \textit{Log(assets)}, \textit{Leverage}, \textit{Cash flow volatility}, \textit{Average debt maturity}, \textit{Debt source specialization}, \textit{Bank debt percent}, \textit{macroeconomic factors}, \textit{industry and year fixed effects}). \quad (7)$$

²⁹ This is a common method to deal with endogeneity problem in the loan contracting literature (e.g., Lou and Otto, 2017).

There is no such a debt dispersion model proposed in the literature; thus, we build our own debt dispersion model based on some findings in Choi et al. (2017). They suggest that a shock to the probability of market freezes leads to a higher target debt maturity dispersion, and that dispersion of debt maturities is more important for firms with valuable projects, higher leverage, or lower cash flows from assets in place. Therefore, we consider a dispersed maturity structure is a function of a firm's size, leverage, cash flow volatility, and macroeconomic condition. Furthermore, according to our estimated correlations among debt structure variables (see Online Appendix Table OA6), we find three variables are significantly associated with debt maturity dispersion. They are *Average debt maturity*, *Bank debt percent*, and *Debt source specialization*. We thus also include these variables into the dispersion equation. To estimate the SEM model, we use a generalized method of moments (GMM), with the exogenous variables as instruments in the moment conditions. The GMM ensures that the standard errors of the estimates are heteroskedasticity and autocorrelation consistent.³⁰

A SEM produces the results in Table 10.³¹ Debt dispersion and the number of covenants exhibit a significant, bi-directional relation. The effect of debt dispersion on reducing bank loan covenants remains robust after accounting for endogeneity. In terms of the results in the debt dispersion equation, the coefficient for the leverage is positive and significantly different from zero, consistent with the notion that a firm that has more debts is likely to spread out their debts across different maturity dates. The coefficients for the debt source specialization and bank debt percent variables are

³⁰ We do not report the R^2 values for our estimated equations, because as Goldberger (1991) observes, R^2 values reported in system estimation techniques might not fall between zero and one. Unfortunately, there is no widely accepted goodness-of-fit measure for nonlinear system estimates. Other instrumental variable techniques, such as two-stage least squares (2SLS), are special cases of GMM. For example, Greene (2002) and Kennedy (2003) report that, compared with 2SLS estimates, GMM estimates are more efficient when regression errors are heteroskedastic and/or autocorrelated and that GMM estimates coincide with 2SLS estimates otherwise.

³¹ We present results from the second-stage regression estimation. For the covenant regression, the result is based on the regression using loan covenants as the dependent variable, with predicted dispersion variable estimated from the first stage as one of the control variables. The first-stage regression used to generate the estimated values of dispersion variable is not reported.

negative and significantly different from 0, indicating that a firm that more rely on a certain of specific debt financing sources and on bank debts could limit the firm's chance to spread out their debt maturities.

In sum, we use the SEM framework to examine whether debt maturity dispersion is negatively associated with the covenants imposed on bank loans. This framework controls for the possible effects of unobservable factors and a potential reverse causality bias. Our results strongly confirm that a dispersed debt maturity profile is negatively associated with loan covenants and thus we conclude that results are robust to this endogeneity bias correction.

6. Conclusions

We examine the effects of debt maturity dispersion on terms of bank loans. Our analysis shows that a dispersed debt maturity structure reduces the imposition of having restriction covenants in loan agreements. This relation is stronger for firms that are bank dependent, financial constrained, or less credit-worthy, and more pronounced for covenants that are associated with distress risk, that are designed to provide *ex post* monitoring, are related with liquidity risk. We further document that dispersed firms experience decreased risk over the three years after the loan is granted; thus the less frequent use of covenant does not seem to result in more risk-taking. These loan-level results are consistent with the argument that diversifying debt maturing dates in a firm's existing debts help mitigate the agency problem associated with the rollover risk through which the intensified shareholder–debtholder conflict increases credit risk, and enhance monitoring device that mitigate agency problem through which shareholders exploit debt holders by taking more risky investments.

Our extensive robustness tests corroborate our findings. We show that debt maturity dispersion remains its significant reduction effect on covenants after controlling for the short-term debts, the dependence on bank financing, the bank relationship, and the specialization on debt sources; therefore, our results are unlikely due to the difference in other debt structure features affecting covenant restrictions – not difference in the debt maturity dispersion *per se*. Using a simultaneous equation model (SEM), we demonstrate that our results are robust to the endogeneity bias concern about reverse causality and the simultaneous determination of loan covenants and debt maturity dispersion.

Overall, our study shows that diversifying maturities of debts is an effective financing decision to mitigate shareholder-creditor conflicts and has real value implications on financing costs. Further research can be done to explore the effects of debt maturity dispersion on other corporate policies such as the investment policy.

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Appendix A. Capital IQ data

We obtain data from the “Capital IQ - Capital Structure Debt” database provided by Standard & Poor’s. This database contains debt structure information for public and private U.S. firms on an annual and interim basis (i.e., semi-annual or quarterly). We restrict attention to data on annual basis. The unit of observation is a debt-issue/financial-reporting-period-end-date combination. Multiple entries for the same debt-issue/date combination may exist because the relevant information may be reported in multiple financial statements. We clean up the data in the following ways.

First, we use the latest available filings for a debt issue when there are multiple filings for a given filing date (LATESTFILINGFORINSTANCEFLAG= 1). Second, we identify duplicate debt items using company identification (COMPANYID), report date (PERIODENDDATE), and data item identifiers (COMPONENTID); we keep the last observation to remove duplicate debt items. Third we keep data pertaining to the dates that match the dates of Compustat Annual dataset (DATADATE). We merge the Capital IQ data with Compustat data pertaining to the same financial-reporting-period-end-date (PERIODENDDATE) using the “Capital IQ - Identifiers” database that provides a link between the unique firm identifier in Capital IQ (COMPANYID) and the unique identifier in Compustat (GVKEY). Fourth, in some cases, there are duplicate observations; a debt issue can appear multiple times with different issue identifiers on the same filing date. We identify duplicate debt items using company identification (COMPANYID), report date (PERIODENDDATE), principal amounts (DATAITEMVALUE), data descriptions (DESCRIPTIONTEXT), maturity (MATURITYHIGH and MATURITYLOW), and then manually delete redundant items. Fifth, after eliminating duplicate observations, we compare the total debt amounts in Capital IQ and COMPUSTAT Annual. Following Colla et al. (2013), we remove observations for which the total debt in Capital IQ is greater than COMPUSTAT by more than 10%.

Occasionally debt maturity information is missing in Capital IQ. We deal with the missing data problem as follows. First, if the total amounts of debt issues with missing maturity are less than 10% of the total amounts for the firm-year observation, we remove observations with missing maturities (following Choi et al. (2017)). Second, when month and year maturity information is given, we assume that the debt matures at the end of the stated month. When only year is given, we assume that the

debt matures on June 30 of the stated year. Third, we assume that the maturity of the debt component is the same as the average maturity of the firm's other debt of the same type if this information is available (otherwise, it is treated as missing). Fourth, there are also occasions in which maturity ranges are given in the data (e.g., debt of a given type maturing in years t through $t+k$ are aggregated). In these cases, as long as the stated range is less than ten years, we take the midpoint of the stated range. Fifth, following Saretto and Tookes (2013), in the case of commercial paper, we measure the actual maturity of the outstanding commercial paper by setting all commercial paper maturities to thirty days.

Appendix B. Variable descriptions

Variable Names	Variable Definitions
<u>Debt Structure Characteristics (Source: Capital IQ and COMPUSTAT)</u>	
<i>Dispersion</i>	Our benchmark measure of debt maturity. See details in Section 3.2.1.
<i>Dispersion_maturity_weighted</i>	Maturity weighted debt maturity dispersion measure. See details in Section 3.2.2.
<i>Dispersion-predetermined</i>	Alternative <i>Dispersion</i> measure that is measured by using only the outstanding debts that had existed prior to the current year. See details in Section 3.2.3.
<i>Average debt maturity</i>	A weighted average of debt maturity on outstanding debts, where the weight is the amount of debt
<i>Short-term debt percent</i>	Proportion of short-term debts to total debts
<i>3-year debt percent</i>	Proportion of total debt that matures within 3 years
<i>Bank debt percent</i>	Bank debts to total debts ratio
<i>Debt source specialization</i>	$(\sum_{i=1}^7 s_i^2 - 1/7) / (1 - 1/7)$ for $i=1, 2, \dots, 7$. s_i is the fraction of debt type i in a firm's total debt. These debts refer to commercial paper, drawn credit lines, term loans, senior bonds and notes, subordinated bonds and notes, capital leases, and other debt, respectively
<u>Borrower Characteristics (Source: COMPUSTAT and LPC DealScan)</u>	
Log assets	Natural log of total assets
Market-to-book	(Market value of equity plus the book value of debt)/total assets
Leverage	(Long-term debt + debt in current liabilities)/total assets.
Profitability	Earnings before interest, tax, depreciation, and amortization (EBITDA)/total assets.
Tangibility	Net property, plant, and equipment/total assets.
Cash flow volatility	Standard deviation of the cash flow (income before extraordinary items - dividends total) / total assets from the past three year starting in year $t - 2$ to year t .
Distance-to-default	KMV distance-to-default, based on Vassalou and Xing (2004)

<i>Bank Relationship</i>	Dummy variable that equals one if a firm has borrowed from the same lead lender in the past five years
<i>KZ index</i>	The KZ (Kaplan and Zingales, 1997) index is defined as $-1.002 \times \text{Cash flow} + 0.283 \times \text{Tobin's } q + 3.139 \times \text{Debt} - 39.368 \times \text{Dividends} - 1.315 \times \text{Cash holdings}$

Loan Characteristics (Source: LPC DealScan)

Number of Covenants	Number of covenants included in a debt contract
Collateral (1/0)	Dummy variable that equals one if the loan facility uses security
All-in-drawn spread	Loan spread over LIBOR plus fees at the issue date in basis points
All-in-undrawn spread	Undrawn fees and include both commitment and annual fees that the borrower must pay the bank for funds committed for the credit line but not taken
Log loan size	Natural log of the loan (facility) amount, measured in millions of dollars
Log maturity	Natural log of the loan maturity in months
Performance pricing dummy	Dummy variable that equals one if the loan facility uses performance pricing
Loan type dummies	Dummy variable for each loan type, including term loan, revolver greater than 1 year, revolver less than 1 year, and 364-day facility
Loan purpose dummies	Dummy variable for loan purpose, including corporate purpose, working capital, debt repayment, acquisition, backup line for commercial paper

Type of Covenants (Source: LPC DealScan)

Negative Covenants	Number of covenants specifying (1) Asset Sales Sweep, (2) Debt Issuance Sweep, (3) Equity Issuance Sweep, (4) Insurance Proceeds Sweep, (5) Excess Cash Flow Sweep, (6) Dividend Restrictions, and (7) Maximum Capex
Performance Covenants (<i>P</i>)	Number of covenants specifying (1) Minimum Cash Interest Coverage Ratio, (2) Minimum Debt Service Coverage Ratio, (3) Minimum EBITDA, (4) Minimum Fixed Charge Coverage Ratio, (5) Minimum Interest Coverage Ratio, (6) Maximum Debt to EBITDA Ratio, and (7) Maximum Senior Debt to EBITDA Ratio
Capital Covenants (<i>C</i>)	Number of covenants specifying (1) Minimum Quick Ratio, (2) Minimum Current Ratio, (3) Maximum

<i>P/C</i>	Debt to Equity Ratio, (4) Maximum Loan to Value Ratio, (5) Maximum Debt to Tangible Net Worth Ratio, (6) Maximum Leverage Ratio, (7) Maximum Senior Leverage Ratio, and (8) Minimum Net Worth Number of Performance Covenants dividend by the number of Capital Covenants
Minimum Liquidity Requirements	Number of covenants specifying (1) Minimum Interest Coverage Ratio, (2) Minimum Fixed Charge Coverage Ratio, (3) Minimum Current Ratio, (4) Minimum Debt Service Coverage Ratio, (5) Minimum Quick Ratio, (6) Minimum Cash Interest Coverage Ratio
Cash Flow Sweeps	Number of covenants specifying (1) Asset Sales Sweep, (2) Debt Issuance Sweep, (3) Equity Issuance Sweep, (4) Insurance Proceeds Sweep, (5) Excess Cash Flow Sweep
Leverage and Net Worth Restrictions	Number of covenants specifying (1) Maximum Debt to EBITDA Ratio, (2) Minimum Net Worth, (3) Maximum Leverage Ratio, (4) Maximum Senior Debt to EBITDA Ratio, (5) Maximum Debt to Tangible Net Worth Ratio, (6) Maximum Debt to Equity Ratio, (7) Maximum Senior Leverage Ratio, (8) Maximum Loan to Value Ratio,
EBITDA, Capex, and Dividend Restrictions	Number of covenants specifying (1) Dividend Restrictions, (2) Maximum Capex, (3) Minimum EBITDA
<u>Others</u>	
Bank dummies	Bank dummies are based on the lending banks classified by their ultimate parents.
Industry dummies	Industry dummies are based on one-digit SIC code
Credit spreads	The difference between the yields of average BAA corporate bond and AAA corporate bond
Term spreads	The difference between the yields of 10-year Treasury bonds and 1-year Treasury bonds
Credit rating dummies	Dummy variable for each category of S&P firm ratings including AAA, AA, A, BBB, BB, B, and CCC (or worse rating), or without an S&P rating

Table 1. Summary statistics

This table presents the summary statistics for debt structure variables, firm characteristics and loan characteristics for loans granted in U.S. firms from 2002 to 2016 with 5,674 loan observations. The *Dispersion* variable is the benchmark debt maturity dispersion measure that captures how spread out a firm's debt maturity profile is. Two other debt maturity dispersion measures are: *Dispersion_maturity_weighted*, a modified dispersion measure to capture how stretched out the years to maturity are and *Dispersion-predetermined*, an alternative *Dispersion* measure that is measured by using only the outstanding debts that had existed prior to the current year. The detailed construction of the other variables is provided in Appendix B. With two exceptions (noted below), each variable is measured at the fiscal year-end prior to the year in which the covenant index are measured. Covenant index is the sum of 22 covenant indicator variables (see the covenant categories in Appendix B). The last three columns presents the results that compare the number of covenants between the two groups of firms with dispersed and concentrated debt maturity structure, which is classified based on the median of sample distribution on variable *Dispersion*. *** indicate statistical significance at the 1% level.

Variable	Mean	STD	P25	P50	P75	N	<u>Dispersed</u>	<u>Concentrated</u>	Difference
							<u>debt maturity</u>	<u>debt maturity</u>	
							Mean	Mean	
<u>Debt Structures:</u>									
<i>Dispersion</i>	2.52	1.63	1.17	2	3.16	5,674	3.69	1.35	2.34***
<i>Dispersion_maturity_weighted</i>	9.17	11.76	1.69	4.63	11.20	5,674	15.49	2.83	12.66***
<i>Dispersion-predetermined</i>	2.1	1.48	1	1.58	2.66	3,979	2.78	1.29	1.49***
<i>Average debt maturity</i>	6.78	4.64	4.01	5.61	7.85	5,674	7.58	5.98	1.60***
<i>Short-term debt percent</i>	0.16	0.24	0.01	0.05	0.18	5,674	0.12	0.19	-0.07
<i>3-year debt percent</i>	0.37	0.34	0.08	0.27	0.59	5,674	0.31	0.43	-0.12***
<i>Bank debt percent</i>	0.39	0.38	0	0.28	0.76	5,674	0.25	0.54	-0.29***

<i>Bank relationship</i>	0.68	0.47	0	1	1	5,674	0.73	0.63	0.10***
<i>Debt source specialization</i>	0.66	0.26	0.43	0.63	0.93	5,674	0.58	0.73	-0.16***
<u>Firm Characteristics:</u>									
Total Assets (\$ million)	6,179.05	14,403.48	639.86	1,831.36	5,108.10	5,674	9,640.41	2,710.36	6,930.04***
Market-to-book	1.68	0.76	1.2	1.47	1.93	5,674	1.60	1.76	-0.16***
Leverage	0.31	0.19	0.18	0.29	0.42	5,674	0.35	0.27	0.08***
Profitability	0.14	0.07	0.09	0.13	0.17	5,674	0.13	0.14	-0.01***
Tangibility	0.31	0.25	0.11	0.22	0.46	5,674	0.34	0.27	0.07***
Cash flow volatility	0.04	0.06	0.01	0.02	0.04	5,674	0.03	0.05	-0.02***
Distance-to-default	8.31	5.71	4.34	7.14	11.28	5,674	8.28	8.33	-0.05
<u>Loan Characteristics:</u>									
Number of Covenants	4.47	2.61	2	4	6	5,674	3.92	5.02	-1.10***
Number of Negative Covenants	2.37	2.28	1	1	4	5,674	1.94	2.80	-0.86***
Number of Performance (<i>P</i>) Covenants	1.72	0.86	1	2	2	5,674	1.57	1.86	-0.29***
Number of Capital (<i>C</i>) Covenants	0.39	0.61	0	0	1	5,674	0.41	0.36	0.06***
<i>P/C</i>	1.17	0.93	0.33	1	2	1,847	0.94	1.45	-0.50***
Collateral (1/0)	0.6	0.49	0	1	1	5,674	0.49	0.71	-0.22***
All-in-drawn spread (basis points)	195.61	120.31	125	175	250	5,674	177.72	213.55	-35.83***
All-in-undrawn spread (basis points)	30.41	18.83	15	25	40	3,742	27.99	32.92	-4.93***
Loan size (\$million)	541.05	790.04	100	250	640	5,674	746.22	335.44	410.77***
Loan maturity (months)	52.67	17.26	44	60	60	5,674	52.02	53.31	-1.29
Performance pricing	0.66	0.47	0	1	1	5,674	0.67	0.66	0.01
<u>Macroeconomic Variables:</u>									
Credit spread (Baa-Aaa)	1.01	0.36	0.83	0.92	1.13	5,674	-	-	-
Term spread	1.49	0.89	0.79	1.67	2.25	5,674	-	-	-

Table 2. Correlation matrix

This table reports Pearson correlation coefficients between covenant indicator variables for 5,674 loan observations over the 2002 to 2016 period. The correlation coefficients are statistically significant, except for those figures superscripted with NS.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Number of Covenants	1										
(2) <i>Dispersion</i>	-0.34	1									
(3) <i>Dispersion_maturity_weighted</i>	-0.33	0.71	1								
(4) <i>Dispersion-predetermined</i>	-0.36	0.80	0.59	1							
(5) Log(assets)	-0.42	0.61	0.56	0.54	1						
(6) Market-to-book	-0.17	-0.06	-0.01 ^{NS}	-0.03	-0.01 ^{NS}	1					
(7) Leverage	0.15	0.23	0.09	0.18	0.13	-0.14	1				
(8) Profitability	-0.08	-0.05	-0.01 ^{NS}	-0.03 ^{NS}	-0.01 ^{NS}	0.51	-0.07	1			
(9) Tangibility	-0.06	0.10	0.11	0.08	0.05	-0.13	0.22	0.08	1		
(10) Cash flow volatility	0.12	-0.16	-0.12	-0.12	-0.23	0.00 ^{NS}	0.06	-0.09	0.02	1	
(11) Distance-to-default	-0.29	0.04	0.10	0.09	0.18	0.40	-0.33	0.23	-0.16	-0.19	1

Table 3. Effect of debt maturity dispersion on the number of covenants

This table presents the results from models regressing the number of covenants on the measure of debt maturity dispersion. Panel Poisson regressions are used for regressions with covenants as the dependent variable. Standard errors (clustered at the firm level) are robust to both cross-sectional heteroscedasticity and within-firm serial correlations are used in computing t-statistics (in square brackets). ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Variable definitions are in Appendix B.

	(1)	(2)	(3)	(4)
	Dependent Variable: Number of Covenants			
<i>Dispersion</i>	-0.110***	-0.055***		
	[-12.24]	[-6.12]		
<i>Dispersion_maturity_weighted</i>			-0.004***	
			[-3.74]	
<i>Dispersion-predetermined</i>				-0.070***
				[-6.78]
Log(assets)		-0.047***	-0.065***	-0.056***
		[-3.56]	[-4.82]	[-3.51]
Market-to-book		-0.061***	-0.059***	-0.046***
		[-3.85]	[-3.69]	[-2.60]
Leverage		0.165***	0.106*	0.141*
		[2.55]	[1.62]	[1.68]
Profitability		0.144	0.165	0.048
		[1.05]	[1.21]	[0.29]
Tangibility		-0.174***	-0.179***	-0.152***
		[-3.89]	[-3.92]	[-2.78]
Cash flow volatility		-0.032	0.002	-0.077
		[-0.24]	[0.01]	[-0.48]
Distance-to-default		-0.002	-0.002	-0.002
		[-1.15]	[-0.97]	[-1.03]
Log(loan spread)		0.285***	0.284***	0.310***
		[11.71]	[11.67]	[10.05]
Log(loan size)		-0.002	0.002	-0.009
		[-0.23]	[0.20]	[-0.95]
Log(loan maturity)		0.094***	0.095***	0.078***
		[4.98]	[4.95]	[3.36]
Performance pricing		0.094***	0.094***	0.083***
		[5.02]	[4.93]	[3.96]
Credit rating dummies	No	Yes	Yes	Yes
Loan type & purpose dummies	No	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
Pseudo R^2	0.085	0.173	0.170	0.169
N	5,674	5,674	5,674	3,979

Table 4. Effects of debt maturity dispersion on different types of covenants

This table presents regression results for the effect of maturity dispersion in borrowers' existing debt structures on the use of different types of covenants in new loans. The sample period is 2002 to 2016. *Negative* is the number of covenants specifying negative pledges to restrict managerial actions. *Performance* is the number of covenants based on measures of borrowers' operating performance or efficiency. *Capital* is the number of covenants requiring borrowers to maintain certain levels of capital. The *P/C* is the ratio of the number of Performance covenants divided the summation of *Performance* covenants and *Capital* covenants. Liquidity risk-related covenants include *Minimum Liquidity Requirements*, *Cash Flow Sweeps*, *EBITDA*, *Capex*, and *Dividend Restrictions*. Liquidity risk-unrelated covenant is *Leverage and Net Worth Restrictions*. The detailed construction of these covenant categories refers to Appendix B. Control Variables is a vector of all control variables specified in Equation (4). All other variables are defined as in Appendix B. Standard errors are clustered at the borrowing firm level and reported in square brackets. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable (Type of Covenants) (Specification)	<i>Negative</i> (Poisson)	<i>Performance (P)</i> (Poisson)	<i>Capital (C)</i> (Poisson)	<i>P/C</i> (OLS)	<i>Minimum Liquidity Requirements</i> (Poisson)	<i>Cash Flow Sweeps</i> (Poisson)	<i>EBITDA, Capex, and Dividend Restrictions</i> (Poisson)	<i>Leverage and Net Worth Restrictions</i> (Poisson)
<i>Dispersion</i>	-0.110*** [-5.99]	-0.027*** [-2.98]	0.072*** [2.64]	-0.074*** [-4.08]	-0.011** [-2.44]	-0.130*** [-5.06]	-0.077*** [-3.97]	0.008 [1.31]
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Credit rating dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan type & purpose dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2 / Adjusted R^2	0.237	0.057	0.162	0.484	0.006	0.263	0.079	0.018
<i>N</i>	5,674	5,674	5,674	1,847	4,535	5,674	4,104	5,175

Table 5. Cross-sectional variation of the effect of maturity dispersion on covenants

This table presents results from OLS models regressing the number of covenant restrictions on debt maturity dispersion condition on a firm's rating, bank dependence, financial constraints, and creditworthiness, respectively. The *Unrated* is the indicator that equals to one if a firm does not have a rating otherwise zero. The *Speculative Grade* is the indicator that equals to one if a firm does not have a rating otherwise zero. The *High Bank Debt Percent* is the indicator that equals to one if a firm has a bank-to-debt ratio above the median of the sample distribution (i.e., a bank-dependent firm). The *High KZ index* is the indicator that equals to one if a firm has a KZ index above the median of the sample distribution (i.e., a financially constrained firm). A firm is defined to have less creditworthiness if it has a leverage (distance-to-default or Altman's Z-score) value above (bottom) median of the sample distribution. Their corresponding indicator variables are *High Leverage*, *Low Distance-to-Default*, and *Low Altman's Z-score*, respectively. Column (1) includes Unrated, Speculative Grade as well as interaction variables between Dispersion and each of these indicator variables. Similar construction is applied to other models with *High Bank Debt Percent* (Column 2), *High KZ index* (Column 3), *High Leverage* (Column 4), *Low Distance-to-Default* (Column 5), and *Low Altman's Z-score* (Column 6). Control Variables is a vector of all control variables specified in Equation (4). All other variables are defined as in Appendix B. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

	Dependent Variable: Number of Covenants					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Dispersion</i>	-0.130*** [-4.10]	-0.133*** [-4.09]	-0.130*** [-3.75]	-0.110*** [-3.20]	-0.117*** [-3.35]	-0.026 [-0.89]
<i>Dispersion</i> × <i>High Bank Debt Percent</i>	-0.159*** [-2.86]					
<i>Dispersion</i> × <i>High KZ index</i>		-0.096* [-1.94]				
<i>Dispersion</i> × <i>High Leverage</i>			-0.085* [-1.87]			
<i>Dispersion</i> × <i>Low Distance-to-Default</i>				-0.142*** [-3.34]		
<i>Dispersion</i> × <i>Low Altman's Z-score</i>					-0.115** [-2.38]	
<i>Dispersion</i> × <i>Unrated</i>						-0.264*** [-4.88]

<i>Dispersion × Speculative Grade</i>								-0.287***
								[-4.91]
<i>High Bank Debt Percent</i>	0.598***							
	[4.02]							
<i>High KZ index</i>		0.392**						
		[2.46]						
<i>High Leverage</i>			0.229					
			[1.16]					
<i>Low Distance-to-Default</i>				0.284*				
				[1.93]				
<i>Low Altman's Z-score</i>					0.404**			
					[2.38]			
<i>Unrated</i>								1.231***
								[6.31]
<i>Speculative Grade</i>								1.471**
								[2.13]
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Credit rating dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan type & purpose dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R2	0.505	0.503	0.503	0.504	0.504	0.504	0.508	
N	5,674	5,630	5,674	5,674	5,674	5,674	5,674	

Table 6. Effect of maturity dispersion on incidence of collateral and loan prices

This table presents the results investigating the effect of debt maturity dispersion on the incidence of collateral restrictions and loan prices. *Collateral (1/0)* is a dummy variable that takes one if a loan contract includes collateral restriction otherwise 0. Loan prices include two types: (1) All-in-drawn spreads: the fee a borrower pays in excess of the LIBOR for each dollar drawn down; and (2) All-in-undrawn spreads: the fee a borrower pays to banks for securing banks' guarantee on future borrowings. The *Unrated* is the indicator that equals to one if a firm does not have a rating otherwise zero. The *Speculative Grade* is the indicator that equals to one if a firm does not have a rating otherwise 0. Control Variables is a vector of all control variables specified in Equation (4). All other variables are defined as in Appendix B. Standard errors (clustered at the firm level) that are robust to both cross-sectional heteroscedasticity and within-firm serial correlations are used in computing *t*-statistics (in square brackets). ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Dependent Variable (specification)	<i>Collateral (1/0)</i> (Logit)		All-in-drawn spread (OLS)		All-in-undrawn spread (OLS)	
	(1)	(2)	(3)	(4)	(5)	(6)
	<i>Dispersion</i>	-0.165*** [-3.31]	-0.008 [-0.10]	-1.836 [-1.62]	0.909 [0.77]	-0.408** [-2.16]
<i>Unrated</i>		2.119*** [5.14]		57.495*** [6.82]		10.622*** [7.38]
<i>Speculative Grade</i>		2.071** [2.33]		249.960*** [7.29]		34.617*** [5.11]
<i>Dispersion × Unrated</i>		-0.370** [-2.49]		-9.714*** [-3.47]		-1.059** [-2.28]
<i>Dispersion × Speculative Grade</i>		-0.144 [-1.58]		-3.085 [-1.39]		0.018 [0.05]
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Loan characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Credit rating dummies	Yes	Yes	Yes	Yes	Yes	Yes
Loan type & purpose dummies	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2 / Adjusted R2	0.479	0.482	0.581	0.583	0.576	0.576
N	5,638	5,638	5,674	5,674	3,742	3,742

Table 7. Debt Maturity Dispersion and Future Changes in Post-Loan Risk

This table presents the results from OLS regressions of risk changes over three years after a loan is granted on pre-loan debt maturity dispersion variable. We measure risk by examining implied asset volatility (Panel A) and equity volatility (Panel B). The sample is at package-level. Control Variables is a vector of all control variables specified in Equation (4) without loan characteristics. The results for the change in risk over the next 1 year, 2 years, 3 years after a loan origination are reported in Column 1, 2, and 3, respectively. Standard errors (clustered at the firm level) that are robust to both cross-sectional heteroscedasticity and within-firm serial correlations are used in computing t -statistics (in square brackets). ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
	Future 1 year	Future 2 years	Future 3 years
Panel A: Future changes of implied asset volatility			
Pre-Loan debt maturity dispersion	-0.002*	-0.003**	-0.004**
	[-1.69]	[-2.24]	[-2.33]
Firm characteristics	Yes	Yes	Yes
Credit rating dummies	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Adjusted R^2	0.174	0.252	0.278
N	3,774	3,539	3,274
Panel B: Future changes of equity volatility			
Pre-Loan debt maturity dispersion	-0.003	-0.005**	-0.006**
	[-1.19]	[-1.97]	[-2.03]
Firm characteristics	Yes	Yes	Yes
Credit rating dummies	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Adjusted R^2	0.286	0.354	0.353
N	3,728	3,493	3,235

Table 8. Effects of debt maturity dispersion on tightness of covenants

This table presents the results from OLS regressions of covenant strictness on debt maturity dispersion variable. The *Tight_Index_All* stands for the tightness of a loan. *Tight_Index_Performance* and *Tight_Index_Capital* measure the tightness of *Performance covenants* and *Capital covenants* for a loan respectively. The detailed construction of covenant tightness can refer to Section 5.1. Standard errors (clustered at the firm level) that are robust to both cross-sectional heteroscedasticity and within-firm serial correlations are used in computing *t*-statistics (in square brackets). ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Dependent Variable	<i>Tight_Index_ALL</i>			<i>Tight_Index_Performance</i>			<i>Tight_Index_Capital</i>		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Dispersion</i>	-0.021*			-0.042***			0.022**		
	[-1.73]			[-3.56]			[2.38]		
<i>Dispersion_maturity_weighted</i>		-0.004***			-0.006***			0.001	
		[-2.62]			[-4.31]			[1.23]	
<i>Dispersion-predetermined</i>			-0.028*			-0.048***			0.018*
			[-1.90]			[-3.23]			[1.73]
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Credit rating dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan type & purpose dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.315	0.316	0.309	0.267	0.270	0.303	0.233	0.229	0.254
<i>N</i>	1,242	1,242	867	1,242	1,242	867	1,242	1,242	867

Table 9. Effect of debt maturity dispersion on the number of covenants conditional on other debt structure characteristics

This table presents coefficient estimates for the effect of Debt maturity dispersion conditional on other characteristics of the borrowers' existing debt structures. *Average debt maturity* is the measure of weighted average debt maturity of a firm's existing debt. *Short-term debt percent* is the percentage of short-term debts in a firm's total existing debt. *3-year debt percent* is the percentage of percentage of total debt that matures within 3 years in a firm's total existing debt. *Debt source specialization* is $HHI = (\sum_{i=1}^7 s_i^2 - 1/7)/(1 - 1/7)$. s_i for $i=1, 2, \dots, 7$ is the fraction of debt type I in a firm's total debt. Following Colla, Ippolito, and Li (2013), these debts refer to commercial paper, drawn credit lines, term loans, senior bonds and notes, subordinated bonds and notes, capital leases, and other debt, respectively. *Bank debt percent* is the percentage of bank debt in a firm's total existing debt. *Bank relationship* is an indicator variable equals one if a firm has borrowed from the same lead lender in the past five years and zero otherwise. Although we only report the coefficients on key variables, each model is estimated with all of the variables used in Table 4. The variables are defined in Appendix B. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable: Number of Covenants					
<i>Dispersion</i>	-0.056***	-0.054***	-0.055***	-0.052***	-0.055***	-0.061***
	[-6.17]	[-6.00]	[-6.05]	[-5.67]	[-6.06]	[-6.56]
<i>Average debt maturity</i>	-0.003					
	[-1.29]					
<i>Short-term debt percent</i>		-0.090**				
		[-2.38]				
<i>3-year debt percent</i>			-0.035			
			[-1.39]			
<i>Bank debt percent</i>				0.057**		
				[2.34]		
<i>Bank relationship</i>					0.056***	
					[3.17]	
<i>Debt source specialization</i>						-0.116***
						[-3.36]
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Loan characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Credit rating dummies	Yes	Yes	Yes	Yes	Yes	Yes
Loan type & purpose dummies	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R ²	0.173	0.173	0.173	0.173	0.173	0.173
N	5,674	5,674	5,674	5,674	5,674	5,674

Table 10. SEM

This table presents the results of a SEM that includes the loan covenant and debt maturity dispersion (Equations 5 and 6). The model is applied on the package-level sample. We estimate the SEM with a GMM, using the exogenous variables as instruments in the moment conditions. The GMM estimation method ensures that the standard errors of the estimates are heteroskedasticity and autocorrelation consistent. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Two-Equation System	
	<i>Number of Covenants</i>	<i>Dispersion</i>
<i>Number of Covenants</i>		-0.813*** [-13.44]
Dispersion	-0.442*** [-20.51]	
Log(assets)	-0.302*** [-9.96]	0.036 [0.86]
Market-to-book	-0.322*** [-9.09]	
Leverage	3.472*** [13.97]	3.749*** [13.94]
Profitability	0.181 [0.69]	
Tangibility	-0.778*** [-7.82]	
Cash flow volatility	-0.135 [-0.20]	-0.023 [-0.04]
Distance-to-default	-0.045*** [-9.67]	
Average debt maturity		-0.013*** [-3.41]
Debt source specialization		-0.847*** [-11.35]
Bank debt percent		-0.306*** [-6.93]
Constant	6.721*** [13.48]	3.618*** [7.40]
Loan characteristics	No	No
Credit rating dummies	Yes	No
Loan type & purpose dummies	No	No
Macro controls	Yes	Yes
Industry effects	Yes	Yes
Bank fixed effects	No	No
Year fixed effects	Yes	Yes
N	3,949	3,949

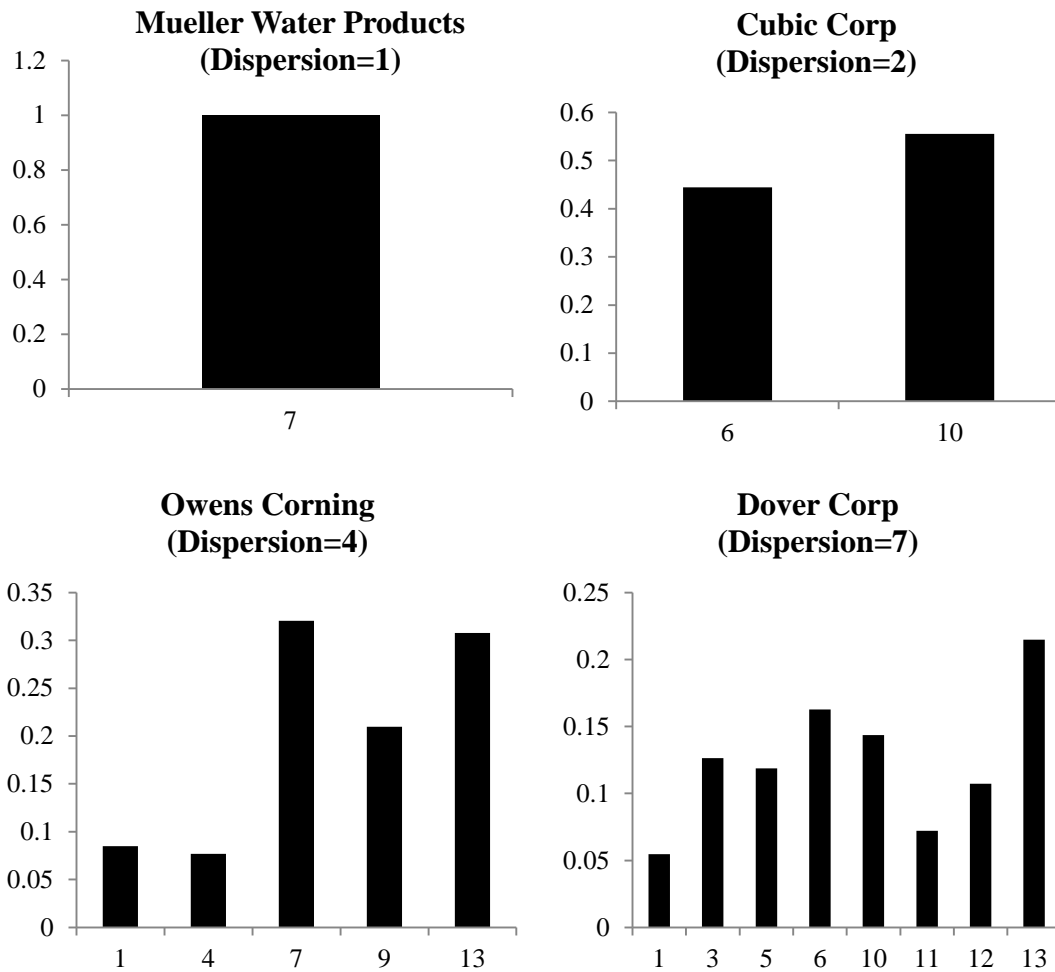
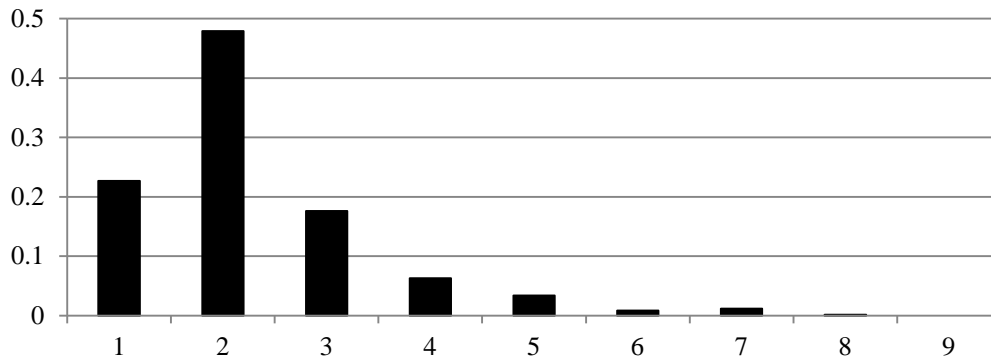


Figure 1. Corporate debt maturity profiles

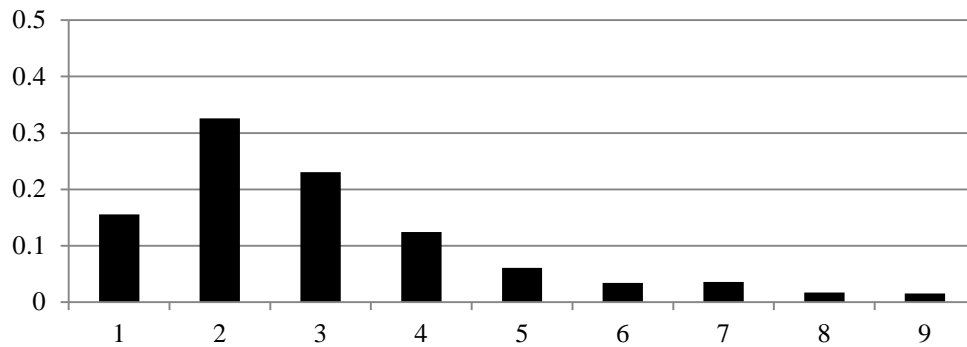
This figure charts the ratios of debts maturing over fourteen maturity buckets for firms with different values of *Dispersion* in the fiscal year 2015. These firms are Mueller Water Products, Cubic Corp, Owens Corning, and Dover Corp and their dispersion values are one, two, four, and seven respectively. Specifically, we define bucket 1 if the maturity of a debt is less than 1 year; bucket 2 if the maturity of a debt is between 1 and 2 year; bucket 3 if the maturity of a debt is between 2 and 3 year and so on. We define bucket 10 when the maturity of a debt is between 9 and 10 year. We further define two five-year maturity buckets for maturities of 10 to 15 years and 16 to 20 years, respectively (i.e., bucket 11 and bucket 12), and a bucket for maturities longer than 20 years (i.e., bucket 13).

Short



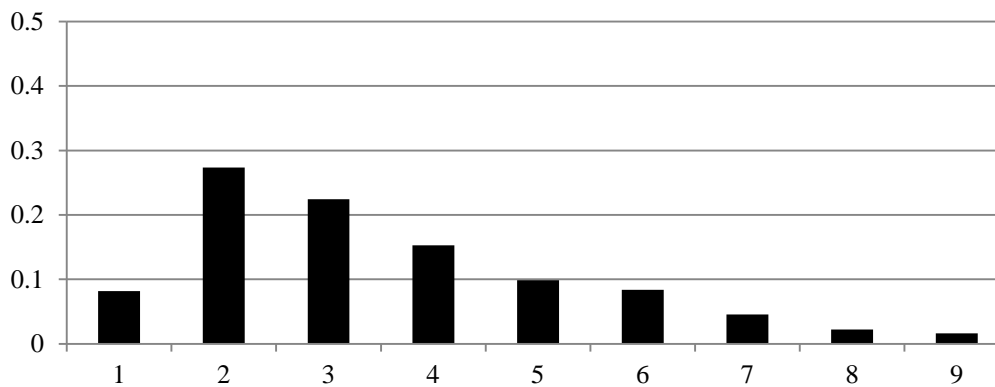
(a) Short Maturity

Intermediate



(b) Intermediate Maturity

Long



(c) Long Maturity

Figure 2. Distribution of debt maturity dispersion

This figure plots distribution of debt maturity dispersion variable for three groups of firms based on their short, intermediate, and long debt maturity.