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Debt heterogeneity and covenants

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Abstract

Coordination failure among owners of heterogeneous debt types increases distress costs. Covenants reduce expected distress costs by lowering the probability of liquidity shortages, increasing liquidation values, and incentivizing creditor monitoring. We predict and find that new debt contracts include more covenants when borrowers' existing debt structures are more heterogeneous. Our findings suggest that covenants are not only used to address creditor-shareholder conflicts but also to reduce the expected costs of coordination failure among creditors. Further, our results indicate a dynamic component missing from static debt structure models: Debt heterogeneity entails additional covenants (i.e., constraints) when raising future debt.

JEL classification: G32

Keywords: Debt Heterogeneity, Debt Covenants, Creditor Conflicts, Coordination Failure

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1 Introduction

Companies often rely on multiple sources of debt financing (e.g., loans, bonds, and leases) at the same time (Rauh and Sufi (2010), Colla, Ippolito, and Li (2013)). It is well established that the owners of heterogeneous debt types may disagree on the best course of action and fail to coordinate in case of default (Gertner and Scharfstein (1991), Asquith, Gertner, and Scharfstein (1994), Bolton and Scharfstein (1996)). Such coordination failure between different lenders increases the cost of financial distress, and creditors' anticipation thereof can make debt financing more expensive (Giammarino (1989), Hoshi, Kashyap, and Scharfstein (1990), Wruck (1990), Gertner and Scharfstein (1991)).

In this paper, we examine the use of covenants as a means to mitigate the impact of "debt heterogeneity" – the simultaneous use of several, heterogeneous debt types – on the cost of financial distress. Debt heterogeneity increases the expected cost of default because it increases the risk that creditors fail to coordinate on an efficient default resolution. One reason for such coordination failure is that creditors with different cash flow rights, investment horizons, and relationships to the borrower may pursue different objectives. Another reason is that a more heterogeneous debt structure is likely to comprise a larger number of creditors that hold smaller amounts of debt each and thus have lower incentives to monitor the borrower. As a consequence, these creditors may become less well informed about the borrower and make less efficient liquidation or restructuring decisions conditional on default. Covenants can help address both issues. They can reduce the risk of liquidity defaults and increase the assets' liquidation value, so that creditor coordination is less often required and less important. Covenants can also incentivize monitoring, so that creditors become better informed and are able to make more efficient default resolution decisions. We thus predict that debt contracts of borrowers with more heterogeneous debt structures include more covenants.

Our empirical analyses support this prediction. We begin by showing that debt heterogeneity is associated with a lower likelihood of successful creditor coordination: Bankruptcy filings of firms with more heterogeneous debt structures are less likely to include a prearranged resolution plan. Next, we show that

heterogeneity in borrowers' debt structures is related to the use of covenants. Analysing detailed information on the debt structures of 1,409 U.S. firms and the contract terms of 3,944 loans issued between 2001 and 2010, we find that new loans include more covenants when the borrowing firms' existing debt consists of multiple, heterogeneous debt types (e.g., bank loans, public bonds, commercial paper, and capital leases). Specifically, our estimates imply that an increase in debt heterogeneity from the 25th to the 75th percentile is associated with an increase in the total number of covenants in the loan contracts by 10% to 13%.

When examining which covenants become more prevalent, we find an increase in new covenants – i.e., covenants that are not included in already outstanding loans – as well as stricter covenants – i.e., covenants that specify more stringent financial ratios. Regarding the types of covenants, we find an increase in the use of minimum liquidity requirements and cash flow sweeps as well as minimum earnings and maximum investment and payout restrictions.[1] These results are consistent with the notion that the additional covenants are used to reduce the expected cost of liquidity defaults. To the best of our knowledge, we are the first to document this link between heterogeneity in borrowers' debt structures and the use of covenants.

Our findings have important implications. First, our results show that the composition of a borrower's existing debt – not just the level or leverage ratio – is related to the use of covenants in new debt contracts. Second, our findings indicate that covenants are not only used to address conflicts between shareholders and creditors (as emphasized in prior literature) but also to reduce the expected cost of coordination failure among creditors. Thus, creditor conflicts and coordination failure play a role not only ex post (i.e., conditional on distress) but also ex ante (i.e., at origination, when the debt contracts are written). Third, our results point towards a dynamic aspect missing from static debt structure models: Borrowing from heterogeneous sources entails additional covenants (i.e., constraints) in future debt contracts. Our findings thus motivate

[1] Cash flow sweeps prescribe that the proceeds from certain activities (e.g., asset sales) be used to repay the debt. Throughout the paper, we refer to a number of restrictive provisions – including cash flow sweeps – generically as covenants. A list of all covenants considered in our analyses is provided in the appendix.

further theoretical work on the dynamic consequences of the simultaneous use of heterogeneous debt types.

Our measure of heterogeneity in a borrower's existing debt structure is based on Colla, Ippolito, and Li (2013). First, we classify each component of a firm's outstanding debt as one of seven types: senior bonds and notes, subordinated bonds and notes, commercial paper, term loans, drawn credit lines, capital leases, and other debt. Second, we compute the Herfindahl-Hirschman Index (HHI) among the seven debt types. Finally, we define *Debt Heterogeneity* as $1 - HHI$. We also consider four alternative measures and show that our results are not sensitive to the way we define *Debt Heterogeneity*.

Debt structures are not randomly assigned but the outcome of a dynamic contracting problem. The non-random assignment and complex interplay among different contract terms make it difficult to isolate the relation between a single characteristic – debt heterogeneity – and a specific contractual feature – covenants. To examine this relation, we rely on variation that is orthogonal to the determinants of debt heterogeneity and the use of covenants documented in prior literature as well as a large number of fixed effects. Despite the absence of a natural experiment, we believe that our findings are informative. First, our results are not explained by any of the determinants of debt heterogeneity or covenant usage that have been studied in the extensive empirical literature on debt contracting. Second, our findings – including their cross-sectional variation – correspond closely to theoretical predictions.

A particular concern is that the observed relation between debt heterogeneity and the use of covenants is due to differences in credit risk. However, consistent with the predictions of Bolton and Scharfstein (1996), Colla, Ippolito, and Li (2013) find that firms with lower credit risk display higher levels of debt heterogeneity. Moreover, lower credit risk should arguably lead to fewer covenants in the loan contracts (Rauh and Sufi (2010)). Hence, differences in credit risk should induce a negative correlation between debt heterogeneity and the number of covenants that would bias against finding the positive relation that we predict. Nonetheless, to mitigate the concern that differences in credit risk drive our results, we include indicator variables for all possible credit ratings that a borrower may have in all analyses.

We also control for firm and industry×year-interaction fixed effects as well as for different loan types and loan purposes. Thus, our findings cannot be explained by unobserved, time-invariant borrower characteristics, macro-economic conditions that affect all firms in a given industry and year, or differences in the loan types or the purposes for which the firms borrow. In addition to the fixed effects, we control for time-varying borrower characteristics that have been shown to affect debt heterogeneity and the use of covenants (e.g., firm size, leverage, market-to-book ratio, tangibility, profitability, cash flow volatility, R&D intensity, dividend payouts, abnormal accruals, sales growth, stock returns, and business complexity). Finally, we show that controlling for other debt structure characteristics (e.g., average maturity, seniority, complexity) and other debt contract terms (e.g., face value, maturity, interest spread) does not change the results.

We further corroborate our findings with an instrumental variable two-stage least squares estimation. For this purpose, we exploit changes in borrowers' debt heterogeneity that are due to the maturing of long-term debt. When a large portion of long-term debt matures, firms tend to replace the maturing debt with a mixture of new debt instruments. This, in turn, tends to increase the heterogeneity in their debt structures. The long-term debt's maturity, however, was determined at issuance and is thus plausibly exogenous (Almeida, Campello, Laranjeira, and Weisbenner (2011)). We also estimate a Heckman selection model to account for firms' choice to obtain new loans and find that our results are unlikely to be driven by a selection bias.[2]

The relation between debt heterogeneity and the use of covenants is likely to be weaker if the risk of financial distress is low. Intuitively, if the debt were entirely risk-free, creditor coordination would not matter. Consistent with this conjecture, we find a weaker association between debt heterogeneity and covenant usage for borrowers with low default risk and/or low leverage. We further examine variation in information collection and monitoring costs. The purpose of this analysis is to study the relative importance of the differ-

[2]In the supplemental internet appendix, we further show that our findings are neither driven by loans without any reported covenants nor by borrowers with extremely high or low levels of debt heterogeneity. An analysis of bond contract terms reveals that heterogeneity in borrowers' existing debt structures is also associated with a larger number of covenants in newly issued bonds.

ent channels through which covenants can reduce the expected cost of default: reducing the risk of liquidity shortages, increasing liquidation values, and incentivizing creditor monitoring. We find only weak evidence that the relation between debt heterogeneity and the use of covenants depends on information collection and monitoring costs. This suggests that the primary purpose of the additional covenants may not be to incentivize additional creditor monitoring, but rather to reduce the risk of liquidity defaults and to increase liquidation values by affecting borrowers' behavior.

Our paper is related to two strands of the literature: empirical work on debt contracting and research on firms' simultaneous use of different types of debt. Regarding empirical research on debt contracting, the existing literature has mostly focused on conflicts between shareholders and debtholders.[3] We contribute to this literature by highlighting how debt heterogeneity and the anticipation of conflicts and coordination failure among the owners of different debt types relate to an important contractual feature of corporate loans: covenants. Indeed, our findings provide evidence that covenants are not only used to mitigate conflicts between equity holders and creditors (e.g., Smith and Warner (1979), Bradley and Roberts (2015)) but also to address the risk of coordination failure among creditors that own different types of debt. Hence, our results show that not only the level of debt or the debt-to-equity ratio but also the composition of a borrower's existing debt is associated with the use of covenants in new debt contracts.[4]

Concerning empirical research on debt structures, several papers provide evidence of firms' simultaneous use of different types of debt. Rauh and Sufi (2010) show that debt heterogeneity is a first-order aspect of capital structure and that many firms use different types of debt at the same time. Colla, Ippolito, and Li (2013) find that large, rated firms tend to rely on multiple debt types. Small, unrated firms tend to rely

[3]E.g., Smith and Warner (1979), Davydenko and Strebulaev (2007), Demiroglu and James (2010), and Bradley and Roberts (2015). An exception are Dass, Nanda, and Wang (2012), who focus on conflicts within loan syndicates.

[4]This finding is related to Booth (1992), who shows that bank loans obtained by firms with outstanding public debt carry lower spreads, and to Datta, Iskandar-Datta, and Patel (1999), who provide evidence that the existence of bank debt helps reduce the yield spread for first-time bond issuers.

predominantly on a single type of debt. However, so far, this literature is largely silent on the consequences of the simultaneous use of heterogeneous debt types. Our findings contribute to this literature by showing that heterogeneity in firms' debt structures goes hand in hand with an increase in the use of covenants.

Additional covenants are likely to impose additional constraints on a borrower's operating and financial policies (Chava and Roberts (2008), Nini, Smith, and Sufi (2009, 2012), Roberts and Sufi (2009)). Our findings thus point to one of the costs of debt heterogeneity: additional, restrictive provisions in future debt contracts. The associated lack of financial and operational flexibility may be one of the reasons why many firms appear to avoid excessive heterogeneity in their debt structures (Colla, Ippolito, and Li (2013)). Further, our empirical results indicate a dynamic component that is missing from static models of optimal debt structures: More debt heterogeneity today entails additional covenants (i.e., constraints) in the future. Hence, our findings also have implications for the large body of theoretical research that seeks to understand the costs and benefits of homogenous versus heterogeneous debt structures.[5]

2 Predictions

The interests of different creditors may not always be fully aligned due to differences in cash flow rights, investment horizons, and non-financial relations to the borrower. As a consequence, there may be disagreement among the creditors regarding the operating and financial policies that the borrower should follow. Further, due to free-rider problems and asymmetric information, multiple creditors may be unable to coordinate on the best course of action in case of distress or on a default resolution plan in case of bankruptcy (e.g., Ivashina, Iverson, and Smith (2016)). It is well established in the theoretical literature that such disagreement and coordination failure can lead to a run on the borrower, decrease the expected liquidation value of

[5] E.g., Diamond (1991, 1993), Berglöf and von Thadden (1994), Bolton and Scharfstein (1996), Bolton and Freixas (2000), Park (2000), Bris and Welch (2005), DeMarzo and Fishman (2007), and Zhong (2014).

the borrower's assets, and lead to inefficient liquidation.[6] Empirical evidence that financial distress is more costly for firms with creditor conflicts is provided, e.g., by Hoshi, Kashyap, and Scharfstein (1990).

Debt heterogeneity – the use of multiple, heterogeneous debt types – is likely to increase the risk of disagreement and coordination failure among the creditors. Intuitively, if there is only a single type of debt, all creditors hold the same type of claim against the borrower. This limits the scope for conflicts. If, however, the borrower's debt structure comprises many heterogeneous debt types, the potential for conflicts is likely to be larger as the different lenders' interests are less likely to be aligned. The owners of commercial paper, for example, may only care about the short-term prospects of the borrower. Relationship banks may take a more long-term view. Bondholders may only have a financial stake in the debtor, while leasing companies may also have commercial interests. Some lenders may hold senior, collateralized claims. Others may hold junior, unsecured debt. Creditors holding different types of debt may thus disagree on the corporate policies that the borrower should follow (e.g., the optimal level of cash holdings, capital investments, or R&D expenditures) and fail to coordinate in case of distress or bankruptcy (Gertner and Scharfstein (1991), Asquith, Gertner, and Scharfstein (1994), Bolton and Scharfstein (1996)). To the extent that debt heterogeneity goes hand in hand with a larger number of creditors each holding smaller amounts of debt, the creditors may also have insufficient incentives to monitor the borrower. As a consequence, they may be less well informed and thus make less efficient liquidation decisions in case the borrower defaults (Rajan and Winton (1995)).

The fact that borrowing simultaneously from different sources can increase the cost of financial distress raises the question why firms do not borrow from a single lender instead. The key reason proposed in the literature is that borrowing from multiple sources deters strategic defaults (e.g., Berglöf and von Thadden (1994), Bolton and Scharfstein (1996)):[7] Having to bargain with multiple creditors that are unable to coordi-

[6] E.g., Diamond and Dybvig (1983), Gertner and Scharfstein (1991), Bolton and Scharfstein (1996), Goldstein and Pauzner (2005), and He and Xiong (2012).

[7] Another reason is that maintaining relationships with multiple lenders may be beneficial if individual lenders (e.g., a bank) can fail (Detragiache, Garella, and Guiso (2000)).

nate reduces the borrower's expected payoffs from defaulting strategically (i.e., despite being able to service the debt) and thus the incentives to do so. The downside is that the creditors' inability to coordinate also increases the cost of liquidity defaults (i.e., defaults that are not strategic but due to a shortage of cash). The optimal debt structure balances the two effects. In light of this trade-off between deterring strategic defaults on the one hand and suffering from costlier liquidity defaults on the other, debt heterogeneity has a positive and a negative side: By making creditor coordination more difficult, debt heterogeneity helps deter strategic defaults, but it also increases the cost of liquidity defaults.

The central prediction of our paper rests on the idea that covenants can lower the expected cost of liquidity defaults by reducing the probability of liquidity shortfalls and increasing the efficiency of liquidation or restructuring conditional on default. First, covenants can help prevent managers from taking actions that reduce overall firm value but are privately optimal because they transfer wealth from creditors to shareholders (Tirole (2006)). Examples of such actions are dividend payouts that increase the risk of a liquidity default or excessive risk taking that reduces the assets' liquidation value (Jensen and Meckling (1976)). Covenants can restrict such actions directly (e.g., in the form of dividend or investment restrictions) or indirectly by requiring the borrower to maintain financial ratios (e.g., interest coverage or leverage) above or below pre-specified thresholds. If the covenants are violated, creditors have the right to intervene (Gârleanu and Zwiebel (2009), Roberts and Sufi (2009)). The resulting threat of creditor intervention incentivizes/disciplines managers because a loss of control would lead to a loss of the associated (private) benefits.[8]

Second, covenants can provide creditors with additional incentives to monitor the borrower (Rajan and Winton (1995)). The intuition is that creditors gain additional rights (e.g., to accelerate repayment) when a covenant is violated – but only if they can prove the violation. To do so, they must monitor the borrower. In the process, the creditors learn information that improves their decisions (e.g., whether or not to liquidate).

[8] In practice, lenders often use the threat of demanding immediate repayment upon a covenant violation to renegotiate the credit agreement and impose stronger contractual terms on the borrower (Nini, Smith, and Sufi (2012)).

However, while more efficient decisions are a public good from which all investors benefit, monitoring is privately costly. Hence, covenants may be needed to incentivize the (socially) optimal level of monitoring.

By prescribing directly what borrowers can and cannot do, incentivizing/disciplining management, and increasing creditor monitoring, covenants can thus reduce the probability of liquidity defaults (e.g., by requiring the maintenance of a minimum amount of liquidity) as well as increase efficiency conditional on a default (e.g., by ensuring that creditors are well informed when deciding whether or not to liquidate). Hence, debt covenants can help lower the expected cost of liquidity defaults and, through this channel, the cost of debt heterogeneity. As a consequence, debt contracts of borrowers with more heterogeneous debt structures are likely to include more covenants. This motivates our first prediction.[9]

> ***Prediction 1:*** *New debt contracts of borrowers with more heterogeneous existing debt structures include more covenants.*

The above arguments suggest that the relation between debt heterogeneity and the use of covenants is likely to be stronger if the risk of financial distress is high. In bad times, when refinancing and restructuring decisions must be taken swiftly, coordination failure among a firm's creditors is likely to be more costly than during good times, when the firm is able to meet all of its obligations. Intuitively, if the debt were entirely risk-free, creditor coordination would not matter. This motivates our second prediction.

> ***Prediction 2:*** *The relation between heterogeneity in borrowers' existing debt structures and the number of covenants in new debt contracts is weaker for borrowers with lower default risk.*

The channels through which covenants can reduce the expected cost of liquidity defaults – lowering the risk of liquidity shortages, increasing liquidation values, and incentivizing monitoring – are not mutually

[9] Covenants, of course, entail not only benefits but also costs and are chosen optimally such that the marginal benefit equals the marginal cost. Formally, our prediction rests on the argument that debt heterogeneity increases the marginal benefit of a covenant (e.g., lowering the risk of a liquidity default) relative to its marginal cost (e.g., constraining financial or operational flexibility).

exclusive. However, their relative importance may vary between firms and over time. In particular, the model of Rajan and Winton (1995) suggests that using covenants to incentivize additional monitoring is less important if the costs of collecting and processing information are low. This motivates our third prediction.

> ***Prediction 3:*** *The relation between heterogeneity in borrowers' existing debt structures and the number of covenants in new debt contracts is weaker for borrowers with lower information collection and monitoring costs.*

3 Data

3.1 Data Sources

We obtain information on the different types of debt in the capital structures of U.S. firms from Capital IQ.[10] This database provides detailed information (e.g., debt type, maturity, amount) on firms' outstanding debt at the level of individual components such as bank loans, bonds, or capital leases. We complement this information with data from Compustat and CRSP.

Following Colla, Ippolito, and Li (2013), we drop utilities (SIC codes 4900–4949) and financial firms (SIC codes 6000–6999) from the sample and keep only companies that are listed on the AMEX, NASDAQ, or NYSE. We also drop observations with missing or zero values for total assets or debt or if the firm's book leverage is outside the unit interval. Further, we remove observations for which the difference between the total debt reported in Compustat and the total debt reported in Capital IQ exceeds 10% of the former.

We then augment the dataset with detailed information on loans that are obtained by the firms in our sample during the years 2001 to 2010.[11] Each loan observation is paired with the financial and debt structure information of the borrowing firm, measured at the end of the fiscal year that precedes the date on which

[10] The appendix describes this process in detail.

[11] In the supplemental internet appendix, we examine the relation between debt heterogeneity and bond contract terms and find that heterogeneity in firms' existing debt structures also entails a larger number of covenants in new bond contracts (Table A.6).

the loan is issued.[12] The different loan characteristics (e.g., amount, maturity, covenants, interest spread) are obtained from DealScan, the standard source of loan contract information used in the literature (e.g., Chava and Roberts (2008), Christensen and Nikolaev (2012), Denis and Wang (2014), Graham, Li, and Qiu (2008), Murfin (2012)). If multiple loans are packaged into a single deal, we keep only the largest loan in the package. We do so because loan covenants are designed at the package level, i.e., the same set of covenants applies to all loans within a given package (Bradley and Roberts (2015), Christensen and Nikolaev (2012), Murfin (2012)). Our empirical findings are robust, however, to including all loans within each loan package in the sample. Our final dataset comprises 3,944 loans obtained by 1,409 firms between 2001 and 2010.

3.2 Debt Heterogeneity

We measure the level of heterogeneity in firms' existing debt structures as follows. As in Colla, Ippolito, and Li (2013), we begin by computing the normalized Herfindahl-Hirschman Index (HHI) for each firm j at the end of each year t,

$$HHI_{j,t} = \frac{\sum_{i=1}^{7} h_{j,t,i}^2 - \frac{1}{7}}{1 - \frac{1}{7}}, \tag{1}$$

where $h_{j,t,i} \in [0,1]$ for $i = 1, 2, 3, \ldots, 7$ is the fraction of debt type i in firm j's total debt at the end of year t. The seven debt types are senior bonds and notes, subordinated bonds and notes, commercial paper, term loans, drawn credit lines, capital leases, and other debt.[13] We then define

$$\textit{Debt Heterogeneity}_{j,t} \equiv 1 - HHI_{j,t}. \tag{2}$$

Debt Heterogeneity ranges from zero to one. It takes the value zero if the firm relies only on a single type of debt. It takes the value one if the firm uses all seven types of debt equally (i.e., if $h_{j,t,i} = 1/7$ for all $i = 1, 2, 3, \ldots, 7$). Low values of the measure thus indicate a low level of debt heterogeneity; high values

[12] The datasets are merged using the DealScan-Compustat link described in Chava and Roberts (2008).

[13] Other debt includes securities sold under an agreement to repurchase, securitization debt, securities loaned, trust preferred securities, and other unclassified borrowing.

indicate a high level.[14] In the supplemental internet appendix, we consider four alternative measures and show that our findings are not sensitive to the way we define *Debt Heterogeneity* (Table A.3).

A potential concern is that debt heterogeneity is not necessarily identical to creditor heterogeneity as the different debt types could in principle be held by the same creditor. To the best of our knowledge, comprehensive ownership data for all debt types in our sample is not publicly available. This lack of data prevents us from computing a measure of heterogeneity that is based directly on the ownership of the different debt claims. However, debt heterogeneity is a plausible proxy for creditor heterogeneity to the extent that different debt types tend to be held by different creditors – a conjecture confirmed by bankers and other finance practitioners in informal discussions. Indeed, Colla, Ippolito, and Li's (2013) finding that many firms avoid excessive debt heterogeneity is consistent with the notion that different debt types are typically held by different creditors and that excessive creditor heterogeneity is costly. Throughout the paper, we thus maintain the implicit assumption that not all debt types are held by the same creditor.

3.3 Firm and Debt Characteristics

All firm and debt characteristics used in our analyses are defined as in Graham, Li, and Qiu (2008), Colla, Ippolito, and Li (2013), and Fresard and Valta (2016). Definitions are provided in the appendix. To mitigate the effect of potential outliers, we winsorize all continuous variables at the 1st and 99th percentile. Using non-winsorized data leads to similar results.

3.4 Summary Statistics

Table 1 presents summary statistics. On average, the firms in our sample hold assets with a book value of \$6.4 billion, have a leverage ratio of 29%, and a market-to-book ratio of 1.7. About half of the firms pay out

[14] *Debt Heterogeneity* abstracts away from heterogeneity within each type of debt. Conflicts among creditors and coordination failure, however, are arguably more likely to occur between different debt types than within a given type, due to differences in cash flow rights, seniority, maturity, control rights, and creditor protection.

cash dividends, 60% have a credit rating, and 50% of the rated firms are considered "investment grade."

Senior bonds and notes, drawn credit lines, and term loans are the firms' most important sources of debt financing. On average, these debt types account for 45%, 21%, and 14% of the firms' total debt, respectively. The average value of *Debt Heterogeneity* is 0.34. To put this number in perspective, consider a firm that relies on two different types of debt. In that case, a value of 0.34 corresponds to one debt type accounting for 82% and another for 18% of the firm's total debt. The minimum of *Debt Heterogeneity* is zero and the maximum is 0.80 (unreported). The standard deviation is 0.26.

The loans in our sample have an average face value of $510 million, a maturity slightly below four years, and carry an interest spread of 172 basis points above the LIBOR. On average, the contracts contain 3.4 covenants, and 58% of the loan agreements include a performance pricing clause.[15] The loan syndicate comprises nine lenders on average, and about half of the loans (53%) are arranged by a relationship bank.

4 Results

4.1 Debt Heterogeneity and Creditor Coordination Failure in Case of Default

A basic premise of our prediction that debt heterogeneity is associated with a larger number of covenants is that heterogeneity increases the risk of coordination failure among the creditors in case of default. To examine the validity of this premise, we obtain data on the bankruptcy filings of U.S. firms between 2001 and 2010 from the UCLA-LoPucki Bankruptcy Database. Next, we define the indicator *Prearranged Resolution of Bankruptcy*. This variable is equal to one if a bankruptcy is filed with an already prearranged resolution plan, suggesting that negotiations among the creditors have been successfully completed even before formally entering bankruptcy.[16] Following Ivashina, Iverson, and Smith (2016), we then estimate the

[15] The average number of covenants increases to 4.6 if we exclude loans with zero reported covenants.

[16] A prearranged resolution plan is included in about one third of the bankruptcy filings in our sample.

following model:

$$\begin{aligned} &\textit{Prearranged Resolution of Bankruptcy}_{j,t} = F\big(\alpha + \beta \times \textit{Debt Heterogeneity}_{j,t-1} \\ &+ \gamma' \textit{Determinants of Prearranged Resolution}_{j,t-1} + \delta' \textit{Determinants of Debt Heterogeneity}_{j,t-1} \\ &+ \textit{Industry FE} + \varepsilon_{i,j,t}\big) \end{aligned} \tag{3}$$

where j and t denote firms and years, respectively. *Determinants of Prearranged Resolution* comprises the natural logarithm of the firm's total assets, an indicator for firms whose pre-bankruptcy EBITDA was positive, an indicator for firms for which data on the pre-bankruptcy EBITDA is available, and a recession indicator (Ivashina, Iverson, and Smith (2016)). *Determinants of Debt Heterogeneity* comprises the firm's leverage, tangibility, profitability, market-to-book ratio, cash flow volatility, R&D intensity, an indicator for firms that pay dividends, and an indicator for firms that have a credit rating (Colla, Ippolito, and Li (2013)). All standard errors are clustered at the industry level, defined by the first three digits of the firms' SIC codes.

Table 2 presents the results. We estimate an OLS model in column (1) and a conditional Logit model in column (2).[17] The coefficient estimate on *Debt Heterogeneity* is negative and statistically significant at the 5% level in both models. This finding corroborates the premise that debt heterogeneity increases the probability that creditors fail to coordinate on a resolution plan if the borrower defaults.

4.2 Debt Heterogeneity and the Use of Loan Covenants

We now test Prediction 1 regarding the relation between heterogeneity in borrowers' existing debt structures and the use of covenants in new loans. Following Demiroglu and James (2010) and Bradley and Roberts (2015), we quantify covenant usage by counting the number of covenants in the loan contracts. We then regress the number of covenants in a given contract on the heterogeneity in the borrower's existing debt

[17] The number of observations (N) reported in the table refers to the number of observations effectively used in the estimation procedure. This number is smaller for the conditional Logit model than for the OLS model because industries in which either all or none of the firms use prearranged bankruptcy resolutions cannot be included in the conditional Logit estimation.

structure, measured at the end of the fiscal year that precedes the date on which the loan is issued. We investigate the relation between debt heterogeneity and the strictness and type of covenants in Section 4.3.

A concern is that firms' debt structures and thus the level of debt heterogeneity are not randomly assigned. Instead, each firm may have a target level of heterogeneity and choose its debt structure accordingly. Colla, Ippolito, and Li (2013) provide empirical evidence regarding the determinants of this choice. They find that firms with a low fraction of tangible assets and highly volatile cash flows have less heterogeneous debt structures. This result is consistent with the intuition that firms with higher expected bankruptcy costs should optimally choose more homogeneous debt structures. In doing so, these firms can avoid the increased risk of coordination failure and inefficient liquidation associated with borrowing from multiple sources. Colla, Ippolito, and Li (2013) further find low levels of debt heterogeneity among firms with high R&D expenditures. One interpretation of this finding is that these firms are more opaque, and only a concentrated debt structure provides creditors with a sufficiently large stake to incentivize costly information collection and monitoring. Finally, Colla, Ippolito, and Li (2013) show that unrated firms have less heterogeneous debt structures, possibly because they lack access to some segments of the debt markets.

To mitigate the concern that differences in the aforementioned characteristics confound the relation between debt heterogeneity and covenant usage, we control in our analyses for all debt structure determinants considered in Colla, Ippolito, and Li (2013). Specifically, we control for each firm's leverage, size, asset tangibility, profitability, market-to-book ratio, cash flow volatility, R&D intensity, and an indicator for firms that pay dividends. In addition, we include the squared value of leverage to allow for a non-linear relation.[18]

We also control for known determinants of covenants. To capture differences in accounting quality, we rely on the modified Jones model (Dechow, Sloan, and Sweeny (1995)). This model allows us to separate each firm's total accruals into normal accruals arising from the firm's core operating activities and abnormal accruals likely to arise from manipulation. Large abnormal accruals imply large abnormal deviations

[18] Dropping $Leverage^2$ from the regressions does not change our findings.

between cash flows and earnings, making it more difficult/costly for creditors to assess borrowers' true economic performance. As a consequence, a larger number of covenants may be required to incentivize creditor monitoring (Rajan and Winton (1995)). We therefore control for abnormal accruals in the regressions.[19] To address differences in growth opportunities, we control for the median analyst EPS growth forecast at the industry level (defined by the first two digits of the borrower's SIC code) as well as for the borrower's annual sales growth and market adjusted return (Fresard and Valta (2016)). To capture differences in the complexity of the borrowers' operations, we control for the number of business segments and include an indicator equal to one in case this information is missing (Chang, Dasgupta, and Hilary (2009)).

We further control for additional characteristics of the existing debt structures and contract terms of the new loans: The average maturity of the borrower's existing debt, the heterogeneity in the existing maturity structure, an indicator equal to one if maturity information for the existing debt is missing, the percentage of existing senior debt, the complexity of the existing debt structure, the number of covenants in already existing loans and bonds, the amount of the new loan, the maturity of the loan, the interest spread on the loan, the number of lenders participating in the loan syndicate, an indicator for the presence of a performance pricing clause in the loan contract, and an indicator for loans arranged by relationship banks.[20]

In addition to the time-varying borrower, debt structure, and loan characteristics, we also include a number of fixed effects. In particular, we include fixed effects for all possible credit ratings – including no rating – based on the borrowers' S&P issuer credit rating reported in Compustat.[21] This allows us to control in a

[19] Assessing firms' accounting quality based on measures of abnormal accruals is a standard approach in the accounting literature (e.g., Bharath, Sunder, and Sunder, 2008).

[20] A potential concern is that the other loan contract terms may themselves be affected by debt heterogeneity (i.e., be outcome variables). In that case, controlling for these contract terms in the regressions can bias the results (e.g., Angrist and Pischke (2009)). We confirm that all our results are robust to dropping the other loan contract terms from the regression specifications (unreported).

[21] S&P describes these ratings as follows: "A Standard & Poor's issuer credit rating is a forward-looking opinion about an obligor's overall creditworthiness. This opinion focuses on the obligor's capacity and willingness to meet its financial commitments as they come due. It does not apply to any specific financial obligation, as it does not take into account the nature of and provisions

non-parametric way for any (possibly non-linear) relation between a borrower's credit rating and the use of covenants. To control for unobservable, time-invariant differences between borrowers, we further include firm fixed effects. To absorb common shocks to all borrowers operating in the same broadly-defined industry (e.g., changes in demand, investment opportunities, or other industry specific conditions), we include industry×year-interaction fixed effects based on the borrowers' Fama-French-12 industry classifications and the years during which the loans are issued. Finally, to distinguish between different types of loans as well as loans obtained for different purposes, we include loan purpose and loan type fixed effects.

In summary, we control for time-varying firm, debt structure, and loan characteristics as well as firm, industry×year-interaction, credit rating, loan purpose, and loan type fixed effects. In the absence of a natural experiment, our empirical strategy is thus to exploit variation in debt heterogeneity that is neither explained by observable determinants that have been documented in the existing literature nor by a large number of fixed effects. That is, we estimate regression models of the following form:

$$\begin{aligned} \textit{Number of Covenants}_{i,j,t} = F\big(&\alpha + \beta \times \textit{Debt Heterogeneity}_{j,t-1} + \gamma' \textit{Firm Characteristics}_{j,t-1} \\ &+ \delta' \textit{Debt Structure Characteristics}_{j,t-1} + \zeta \times \textit{Loan Characteristics}_{i,t} + \textit{Firm FE} + \textit{Industry} \times \textit{Year FE} \\ &+ \textit{Credit Rating FE} + \textit{Loan Purpose FE} + \textit{Loan Type FE} + \varepsilon_{i,j,t}\big) \end{aligned} \tag{4}$$

where i, j, and t denote loans, firms, and years, respectively. All standard errors are clustered at the firm level to account for heterogeneity and within-firm correlation.

We rely on OLS models as our main specification. These regressions provide the best (i.e., minimum mean squared error) linear predictor for the number of covenants. This result holds irrespective of the shape of the underlying conditional expectation function (e.g., whether it is linear or not). However, to corroborate that our findings are not driven by the choice of a linear model, we also report the coefficient estimates of

of the obligation, its standing in bankruptcy or liquidation, statutory preferences, or the legality and enforceability of the obligation." (www.standardandpoors.com)

Poisson models.[22] These estimates can be interpreted as semi-elasticities, i.e., the implied marginal effects are equal to the reported coefficients times the expected value of the number of covenants.

Table 3 presents the results.[23] The OLS models are reported in Panel A and the Poisson models in Panel B. In column (1), we estimate univariate regressions. In column (2), we include the different fixed effects. In columns (3) to (5), we successively add the firm, debt structure, and loan characteristics as control variables. In column (6), we replace the firm and loan type fixed effects with firm×loan type-interaction fixed effects. To conserve space, we do not display the estimated coefficients and associated standard errors of the control variables but report these in the appendix.

The coefficient estimate on *Debt Heterogeneity* is positive and statistically significant in all six columns (at the 5% level in column (6) of Panel A and otherwise at the 1% level). Regarding the economic magnitude, the OLS point estimates imply an increase in the total number of covenants by 10% to 13% – relative to the sample average of 3.4 covenants – for an increase from the 25th to the 75th percentile of the sample distribution of *Debt Heterogeneity*.[24] This result supports Prediction 1: New loans include more covenants when the borrowers' existing debt structures are more heterogeneous.

Table 3 also reveals that the coefficient on *Debt Heterogeneity* is not very sensitive to the inclusion of the different fixed effects and control variables. Adding the fixed effects in column (2) has only a small effect: The coefficient is slightly larger than in column (1). Similarly, adding the firm and debt structure

[22]Note that the coefficients can be consistently estimated because, unlike in many other non-linear models, there is no incidental parameters problem in a Poisson model with fixed effects (e.g., Cameron and Trivedi (2005)).

[23]All regressions are based on our sample of 3,944 loan observations. The number of observations (N) reported in the different columns refers to the number of observations that are effectively used in the estimation procedure. This number can be smaller than the total number of observations in the sample (3,944) because cases with only a single observation for a given fixed effect ("singletons") are dropped in an iterative procedure. Further, groups (as defined by a common fixed effect) in which all loans contain zero covenants cannot be included in the Poisson estimation. This note applies to all subsequent tables.

[24]The interquartile range of *Debt Heterogeneity* is 0.51. Using the sample average of the total number of covenants per loan as an estimate of the expected value, the Poisson models imply an increase in the number of covenants by 11% to 20%.

characteristics in columns (3) and (4) leads to only minor changes: The estimates becomes slightly larger. Controlling for the different loan contract terms in column (5) entails a small reduction of the OLS estimate but a small increase in the Poisson model. Finally, exploiting only variation within combinations of a given borrower and loan type, as is achieved by including firm$\times$loan type-interaction fixed effects in column (6), leads to another small increase in the estimated coefficients – but also renders the estimation more noisy.

These results are important with respect to the concern that our findings may be due to omitted correlated variables. The fact that controlling for the determinants of debt heterogeneity and covenant usage documented in the literature has only a small effect on the coefficient estimates implies that if omitted variables were to explain our results, these variables would have to be highly correlated with debt heterogeneity and covenant usage but only weakly correlated with their known determinants. At the same time, the fact that adding the various fixed effects has only a small effect implies that the unobserved determinants that the fixed effects absorb are only weakly correlated with debt heterogeneity and covenants. The finding that the coefficient estimates are not very sensitive to the inclusion of the different fixed effects and control variables thus mitigates the concern that our results are due to an omitted correlated variable bias.

In the supplemental internet appendix, we show that our findings remain unchanged if we exclude loans for which the number of reported covenants is zero (Table A.1). This analysis is motivated by the potential concern that DealScan may overlook some covenants in the data collection process. Thus, some loans may be falsely reported as not including any covenants, implying measurement error in the dependent variable. However, under standard assumptions, measurement error in the dependent variable does not bias the OLS coefficient estimates. Consistent with this argument, we find similar results after excluding loans for which DealScan does not report any covenants. Moreover, it is arguably more likely that DealScan overlooks all covenants in a loan contract when the true number of covenants is low. Hence, the fact that DealScan reports zero covenants conveys useful information: The true number of covenants is likely to be low (or even zero). For this reason, throughout the paper, we include loans with zero reported covenants in our analyses.

4.3 Debt Heterogeneity and the Strictness and Type of Covenants

Table 3 provides evidence that heterogeneity in borrowers' existing debt structures entails a larger number of covenants in newly issued loans. We now examine the covenants' type and strictness. To this end, we construct several additional variables: *New Covenants* is the number of covenants included in a new loan but not in the borrower's existing loans of the same type. *Stricter Financial Covenants* is the number of financial covenants in a new loan that are stricter than the corresponding covenants in existing loans.[25] *Majority of Financial Covenants Stricter* and *All Financial Covenants Stricter* are indicators equal to one if the majority or all of the financial covenants in a new loan are stricter than the corresponding covenants in existing loans.

We also classify all covenants as belonging to one of four categories: *Minimum Liquidity Requirements* specify minimum thresholds for financial ratios such as the interest coverage or current ratio. *Cash Flow Sweeps* prescribe that the proceeds from certain activities (e.g., asset sales or equity issuances) be used to repay the loan. *EBITDA, Capex, and Dividend Restrictions* specify minimum EBITDA thresholds or restrict capital expenditures or dividends. *Leverage and Net Worth Restrictions* limit leverage or mandate a minimum amount of net worth. For each loan, we then count the number of covenants in each category.

Table 4 presents estimates of the relation between *Debt Heterogeneity* and the variables described above. All regressions are specified as in column (5) of Panel A in Table 3. As before, we do not report the estimated coefficients and associated standard errors of the control variables in order to conserve space.

Column (1) of Panel A shows that heterogeneity in borrowers' existing debt structures is associated with a larger number of new covenants, i.e., covenants that are not already specified in the borrowers'

[25] We focus on nine types of covenants that specify well-defined thresholds for different financial variables: minimum interest coverage, fixed charge coverage, current ratio, quick ratio, tangible net worth, and net worth requirements and maximum debt-to-EBITDA, debt-to-equity, and debt-to-tangible net worth requirements. For each covenant, we compute the absolute value of the difference between the covenant threshold and the value of the corresponding financial variable at the end of the last fiscal quarter prior to the loan's origination date. We then divide the absolute value of the difference by the standard deviation of the corresponding financial variable, which we estimate over the 20 preceding quarters. The resulting variable is our measure of covenant strictness.

existing loans of the same type. The coefficient estimate on *Debt Heterogeneity* is positive and statistically significant at the 5% level. Columns (2), (3), and (4) reveal that debt heterogeneity is also related to stricter covenants. The estimated coefficient on *Debt Heterogeneity* is positive and statistically significant at the 1% level in the regression pertaining to the number of financial covenants that are stricter than those in existing loans (column (2)). The estimates are positive and statistically significant at the 5% level in the regressions pertaining to the dummy variables indicating that the majority of financial covenants or that all financial covenants are stricter than those in the borrowers' existing loans (columns (3) and (4), respectively).

Panel B displays our findings pertaining to the different covenant categories. The results indicate a positive relation between *Debt Heterogeneity* and the number of *Minimum Liquidity Requirements* in column (1), *Cash Flow Sweeps* in column (2), and *EBITDA, Capex, and Dividend Restrictions* in column (3). The estimates are statistically significant at the 5%, 1%, and 10% level, respectively. The estimate is not statistically significant when considering the number of *Leverage and Net Worth Restrictions* in column (4).

Overall, the results presented in Table 4 are consistent with the idea that the additional covenants associated with heterogeneity in borrowers' existing debt structures are indeed aimed at reducing the expected cost of liquidity defaults.[26] We find an increase in the number of covenants that are "new" relative to the covenants in existing loans as well as an increase in covenant strictness. We also find more 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, more requirements to use available cash flows for debt repayments, and more restrictions on alternative uses of cash such as capital expenditures and dividend payouts.

4.4 Cross-Sectional Variation

We now test our cross-sectional predictions. To examine how the relation between debt heterogeneity and the use of covenants varies with borrowers' default risk (Prediction 2), we define two indicator variables:

[26]The covenants' role (reducing the cost of liquidity defaults) thus differs from debt heterogeneity's (deterring strategic defaults).

Investment Grade is equal to one if the borrower has an investment grade credit rating ($BBB-$ or better). *Low Leverage* is equal to one if the borrower's leverage is lower than the sample median.

We also define two indicators to investigate variation with respect to information collection and monitoring costs (Prediction 3). *Transparent Accounting* takes the value one if the borrower's abnormal accruals (scaled by total assets) are smaller than the sample median. The idea is that abnormal accruals render the relation between earnings and cash flows more opaque and make it more difficult for creditors to assess the borrower's true economic performance and future prospects (e.g., Teoh, Welch, and Wong (1988), Sloan (1996), and Sufi (2007)). *Any R&D* takes the value one if the borrower reports positive R&D expenditures. The idea is that forecasting expected future cash flows stemming from research and development is particularly difficult. We thus use the presence of R&D expenditures as a proxy for higher information collection and monitoring costs (e.g., Sufi (2007), and Colla, Ippolito, and Li (2013)).

Table 5 presents the results of OLS regressions in which we interact *Debt Heterogeneity* with the four indicators described above.[27] *Low Leverage*, *Transparent Accounting*, and *Any R&D* are also included on their own in the regressions. *Investment Grade* is absorbed by the credit rating fixed effects.[28] All regressions are otherwise specified as in column (5) of Panel A in Table 3. As before, we do not report the estimated coefficients and associated standard errors of the control variables in order to conserve space.

Columns (1) and (2) show the results regarding the interaction between *Debt Heterogeneity* and *Investment Grade*. Given that 40% of the borrowers in our sample do not have a credit rating, we estimate two regressions: In column (1), we restrict attention to rated firms; in column (2), we include all firms (i.e., rated and not). The coefficient estimate on the interaction between *Debt Heterogeneity* and *Investment Grade* is

[27] We restrict attention to OLS models 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)). For example, in a Poisson model with mean function $E[y|x_1, x_2] = exp(\alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_{12} x_1 x_2)$, the interaction effect is $\partial^2 E[y|x_1, x_2] / \partial x_1 \partial x_2 = [\beta_{12} + (\beta_1 + \beta_{12} x_2) \times (\beta_2 + \beta_{12} x_1)] \times E[y|x_1, x_2]$.

[28] Including *Investment Grade* instead of the credit rating fixed effects leads to very similar results.

negative and statistically significant at the 1% level in both columns. Similarly, the estimated coefficient on the interaction between *Debt Heterogeneity* and *Low Leverage* in column (3) is negative and statistically significant at the 1% level. Both findings support the prediction that the relation between debt heterogeneity and the use of covenants is weaker for borrowers that face a lower risk of financial distress (Prediction 2). Indeed, the null hypothesis that *Debt Heterogeneity* is unrelated to the use of covenants for borrowers with an investment grade credit rating or low leverage cannot be rejected at conventional levels.

Columns (4) and (5) display the results pertaining to variation in information collection and monitoring costs. We find only weak evidence in favor of Prediction 3: The coefficient estimate on the interaction between *Debt Heterogeneity* and *Transparent Accounting* in column (4) is negative (as predicted) but significant only at the 10% level. The estimated coefficient on the interaction between *Debt Heterogeneity* and *Any R&D* is not statistically significant. One interpretation of this (non-)result is that the additional covenants that we find in the loan contracts of borrowers with more heterogeneous debt structures are not included in order to incentivize additional creditor monitoring. This, in turn, would suggest that the covenants' primary purpose is to prevent the borrowers from taking actions that increase the probability of liquidity defaults or decrease their assets' liquidation values. A caveat to this conclusion, however, is that the different purposes that the covenants may serve are not mutually exclusive, and a natural alternative explanation for low statistical significance is, of course, a lack of power.

5 Robustness Tests

We now discuss two robustness tests. First, we corroborate our findings with an instrumental variable two-stage least squares (2SLS) estimation. Second, we estimate a Heckman selection model to mitigate the concern that firms' choice to obtain a loan leads to a selection bias. Additional robustness tests are presented in the supplemental internet appendix: We show that dropping loans without reported covenants (Table A.1) and excluding borrowers with very high or very low levels of debt heterogeneity (Table A.2) does not change

our findings. We also consider four alternative measures of heterogeneity and show that our results are not sensitive to the way we define *Debt Heterogeneity* (Table A.3).

5.1 Instrumental Variable Estimation

The regression specifications presented so far remove any confounding effects of borrower characteristics that do not change over time and of time-varying characteristics that can be expressed as a linear function of the control variables. However, a potentially remaining concern is that *Debt Heterogeneity* may be correlated with unobserved, time-varying characteristics that are related to the use of covenants but not captured by the control variables. To mitigate this concern, we conduct an instrumental variable 2SLS estimation. Specifically, we exploit changes in borrowers' debt structures that are due to the maturing of long-term debt. When a large portion of long-term debt matures, firms tend to replace it with a mixture of new debt instruments. Doing so tends to increase the heterogeneity in their debt structures. Building on this intuition, we use instances when a significant fraction of long-term debt matures to instrument *Debt Heterogeneity*.[29]

To be a valid instrument, the maturing of long-term debt must satisfy two conditions: (1) It must be correlated with *Debt Heterogeneity*, and (2) it must satisfy an exclusion restriction (i.e., be uncorrelated with the error term in the structural equation of interest).[30] The first condition can be tested using the results of the first stage of the 2SLS procedure. The second condition cannot be tested. However, the timing when a firm's existing long-term debt matures was determined many years in the past (at origination) and is thus unlikely to be correlated with current changes in unobserved firm characteristics (Almeida, Campello, Laranjeira, and

[29] Some firms' debt heterogeneity may increase more than others' as some may decide to increase heterogeneity when replacing the maturing debt while others decide to maintain the previous level. The fact that firms may choose how to respond, however, does not invalidate the maturing of long-term debt as an instrument for firms' debt heterogeneity (see, e.g., Angrist and Pischke (2009)).

[30] The two conditions are sufficient if the effect of debt heterogeneity on covenant usage is homogeneous. If the effect is heterogeneous, estimating local average treatment effects requires an additional (untestable) monotonicity condition regarding the impact of the maturing of long-term debt on firms' debt heterogeneity (Imbens and Angrist (1994)).

Weisbenner (2011)). Further, the maturing of long-term debt is unlikely to increase the number of covenants in subsequently issued loans except through its impact on *Debt Heterogeneity*.[31] Hence, the maturing of long-term debt is plausibly exogenous (i.e., plausibly satisfies the exclusion restriction).

For each firm-year combination in our sample, we thus obtain from Compustat the amount of long-term debt that matures during the course of the year. We then construct an indicator variable, *Long-Term Debt Maturing*, that is equal to one if the amount of long-term debt that is due during the year accounts for at least 5% of the firm's total debt at the beginning of the year.[32] To support the argument that firms tend to replace the maturing debt with a mixture of new debt instruments, we also count the number of different types of debt in each firm's debt structure at the end of the year. We then regress this variable (*Number of Debt Types*) on *Long-Term Debt Maturing* to show that, on average, firms indeed increase the number of debt types they use when a significant portion of their long-term debt matures. Finally, we use *Long-Term Debt Maturing* as an instrument for *Debt Heterogeneity* in a 2SLS estimation procedure.

Table 6 presents the results.[33] Column (1) displays the estimated relation between *Long-Term Debt Maturing* and *Number of Debt Types*. The coefficient estimate is positive and statistically significant at the 5% level. This finding provides empirical evidence in support of the economic channel through which the maturing of long-term debt leads to an increase in the heterogeneity in borrowers' debt structures: Firms tend to replace maturing long-term debt with a mixture of different debt instruments.

Column (2) shows the first stage of the 2SLS estimation. The coefficient estimate on *Long-Term Debt Maturing* is positive and statistically significant at the 1% level. This finding confirms that firms' debt

[31] Potential channels for a direct effect could be that the maturing of long-term debt reduces a firm's leverage or that the maturing debt was subject to covenants that now need to be replaced. Both concerns are mitigated by the fact that we control for leverage and the number of covenants in the borrower's already existing debt at the time when the new loan is issued.

[32] The sample mean of *Long-Term Debt Maturing* is 0.40, the standard deviation is 0.49.

[33] The reported sample size is smaller than in column (5) of Panel A in Table 3 because data on the amount of long-term debt that matures during the year before a new loan is issued is not available for all observations.

heterogeneity increases when a significant fraction of long-term debt matures (i.e., that the instrument is relevant). The *F*-statistic on *Long-Term Debt Maturing* is 14.8 and thus exceeds the threshold of ten suggested by Stock, Wright, and Yogo (2002) to guard against weak instruments.

Column (3) shows the second stage. The estimated coefficient on *Debt Heterogeneity* is positive and statistically significant at the 5% level. This result is consistent with Prediction 1 and corroborates our earlier findings: Debt heterogeneity entails more covenants in loan contracts. The point estimate of 6.360 is much bigger than the corresponding OLS estimate (0.692) reported in column (5) of Panel A in Table 3.

There are several potential explanations for this finding. First, the large standard error of the IV estimate indicates that the 2SLS estimation is much noisier than the OLS estimation: Indeed, the 95% confidence interval around the IV estimate, $[0.143, 12.578]$, includes the OLS estimate. Second, if unobserved differences in borrowers' credit risk are not captured by the control variables and fixed effects, then we would expect the OLS estimate to be downward biased. The reason is that firms with lower credit risk should optimally choose more heterogeneous debt structures (Bolton and Scharfstein (1996), Colla, Ippolito, and Li (2013)) but include fewer covenants in the loan contracts (Rauh and Sufi (2010)).

Finally, while the OLS coefficient is an estimate of the (population) average treatment effect (ATE), the IV coefficient is an estimate of the local average treatment effect (LATE) (Imbens and Angrist (1994)): The 2SLS procedure estimates the average treatment effect only for those firms whose debt heterogeneity increases because of the maturing of long-term debt (but not for firms whose debt heterogeneity does not change). The LATE can differ from the ATE if the effect of debt heterogeneity on the use of covenants varies across firms. Suppose, for example, that replacing the maturing debt is more likely to require an increase in debt heterogeneity for financially constrained than for unconstrained firms. In that case, we would expect the LATE (estimated by 2SLS) to be larger than the ATE (estimated by OLS) as the risk of creditor coordination failure is arguably a bigger concern for financially constrained than for unconstrained borrowers. Similarly, we would expect the LATE to be larger than the ATE if firms with larger agency problems

between shareholders and creditors increase their debt heterogeneity more in response to the maturing of long-term debt than firms with smaller agency problems. The reason is that using covenants to prevent managers from taking actions that increase the risk of liquidity defaults (e.g., paying out large dividends) and/or decrease liquidation values (e.g., through asset substitution) is likely to be more important when there are larger agency conflicts between shareholders and creditors.

5.2 Heckman Selection Model

Firms choose whether to raise debt or not. Hence, the firms that enter our sample because they "self-select" to obtain a new loan may not constitute a random draw from the population. Whether such non-random sampling biases our estimation results depends on the selection mechanism. If, for example, the choice to obtain a loan is determined by the explanatory variables that are included in the regressions (and possibly additional, independent random terms), then our OLS estimates are unbiased and consistent (Wooldridge (2002)).[34] As a consequence, the potential concern that heterogeneity in firms' existing debt structures may affect the decision to obtain a new loan does not imply a bias *per se*.

If, however, the choice to obtain a loan depends on the number of covenants that would be included in the contract – i.e., if the selection is based on the outcome variable – then our estimations may be biased. Suppose, e.g., some firms choose not to obtain loans because they foresee that the high level of heterogeneity in their existing debt structures would lead to a large increase in the number of covenants. Our analyses would then underestimate the association between debt heterogeneity and covenant usage because we would be less likely to observe loans for which debt heterogeneity entails a large increase in the number of covenants. In that case, our estimations would provide a lower bound for the true relation between debt heterogeneity and the use of covenants.

Finally, our estimates may be biased if the decision to obtain a loan depends on the explanatory variables

[34]The Poisson models are consistent if the selection is entirely determined by the explanatory variables.

as well as on unobserved determinants that are correlated with the error term in the regression of interest ($\varepsilon_{i,j,t}$ in Equation (4)). To assess the extent of such a potential bias, we estimate a Heckman selection model.

First, we construct a sample of all firms in the Capital IQ database – irrespective of whether or not these firms obtain any new loans.[35] For each firm-year combination, we then compute the value of *Debt Heterogeneity* as well as the different firm and debt structure characteristics that we use throughout our analyses. Finally, we define an indicator, *Obtain Loan*, that takes the value one for a given firm-year combination if the firm obtains a new loan during the year.

Second, we estimate the selection model. Table 7 presents the results. Column (1) shows the first-stage Probit regression. We model the choice to obtain a new loan (i.e., the selection into the sample) as a function of *Debt Heterogeneity* and the time-varying firm and debt structure characteristics.[36] As before, we also include credit rating fixed effects as well as industry×year-interaction fixed effects based on the firms' Fama-French-12 industry classifications. To avoid an incidental parameters problem, we further include fixed effects based on the first three digits of the firms' SIC codes instead of firm fixed effects (Lancaster (2000), Greene (2004)). Finally, we include the percentage of senior bonds and notes, subordinated bonds and notes, and commercial paper in the firms' existing debt – denoted *Public Debt (%)* – as a determinant of the decision to obtain a loan. As in all other analyses, the explanatory variables are measured at the end of the fiscal year preceding the loan issuance date.[37] The standard errors are clustered at the firm level.

Column (2) shows the results of the second stage, an OLS regression of the number of covenants in a new loan contract on *Debt Heterogeneity*, controls, fixed effects, and the inverse Mills ratio obtained from

[35] As before, we keep only U.S. firms listed on the AMEX, NASDAQ, or NYSE, drop utilities (SIC codes 4900-4949) and financial firms (SIC codes 6000-6999) as well as observations with missing or zero values for total assets or debt or if the firms' book leverage is outside the unit interval, and remove observations for which the difference between the total debt reported in Compustat and Capital IQ exceeds 10% of the former. The resulting sample comprises 17,640 firm-year observations.

[36] Loan characteristics and loan purpose and type fixed effects cannot be included as they are only defined if a loan is issued.

[37] If a firm does not obtain a loan during the year, we use the last fiscal year that precedes 1 January.

the first stage. We assume that *Public Debt (%)* satisfies an exclusion restriction (i.e., that it is not itself a determinant of the number of covenants). For this reason, we do not include this variable in the second stage. Including *Public Debt (%)* also in the second stage, however, does not change our findings.

Table 7 reveals two important results. First, the coefficient estimate on *Debt Heterogeneity* (0.688) in column (2) is very similar to the corresponding estimate (0.692) in column (5) of Panel A in Table 3. Further, the estimate is significant at the 1% level, as before. Second, the coefficient on the inverse Mills ratio in the second stage of the Heckman model is only marginally significant (at the 10% level). Together, these findings mitigate the concern that a selection bias due to firms' choice to obtain new loans drives our results.

6 Conclusion

New loans include more covenants when borrowers' existing debt structures comprise multiple, heterogeneous debt types. This finding is consistent with the notion that additional covenants are included in the loan contracts in order to mitigate the impact of debt heterogeneity on the expected cost of financial distress. The existing literature has highlighted the role of covenants in addressing conflicts between creditors and shareholders. Our results suggest that covenants play an additional role: addressing conflicts and coordination failure among creditors that hold different types of debt. As a consequence, not only the level but also the composition of borrowers' existing debt is related to the use of covenants in new debt contracts.

A key insight from the theoretical literature on corporate debt structures is that debt heterogeneity increases the cost of renegotiation. Our findings point to an additional cost of heterogeneous debt structures: More debt heterogeneity today is associated with additional covenants (i.e., constraints) in the future, when new debt is raised. The associated lack of financial and operational flexibility may be one of the reasons why many firms appear to avoid excessive heterogeneity in their debt structures. Hence, our results indicate a component that is missing from static models of optimal debt structures and motivate further theoretical work on the dynamic consequences of debt heterogeneity.

Appendix

Capital IQ Debt Structure Data:

We obtain data from the "Capital IQ - Capital Structure Debt" database provided by Standard & Poor's. This database contains debt structure information for over 60,000 public and private U.S. and non-U.S. firms on an annual and interim basis (i.e., semi-annual or quarterly). Capital IQ's primary source of information are financial reports filed with the SEC. In addition, Capital IQ also relies on other sources such as press releases and company websites. We restrict attention to data pertaining to the end dates of fiscal years of U.S. firms. We do so because coverage of non-U.S. firms and interim information is far less comprehensive.

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 only use information reported in the first filing or in the only filing pertaining to a given fiscal-period-end-date (*FILINGFLAG_COMPANY*$= 1$ or *FILINGFLAG_COMPANY*$= 3$.) For certain types of debt (e.g., revolving credit), Capital IQ reports both the amount of credit drawn and the maximum amount of available credit. In such cases, we only keep observations pertaining to the amount of credit already drawn.[38] Further, we only keep observations for which the implied remaining maturity of the debt issue is positive (*MATURITYDATEHIGH*$-$*PERIODENDDATE* > 0). Using the variables *CAPITALSTRUCTURESUBTYPEID* and *LEVELTYPEID*, we classify individual debt issues based on their type and then aggregate all debt issues within each type.[39]

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*).

[38] The string "facility" in *DESCRIPTIONTEXT* identifies observations pertaining to the maximum amount of available credit.

[39] Issues are classified as commercial paper if the type ID is one, as drawn credit lines if the type ID is two, as term loans if the type ID is three, as senior bonds and notes if the type ID is four and the level ID is one, as subordinated bonds and notes if the type ID is four and the level ID is larger than one, as capital leases if the type ID is five, and as other debt if the type ID is six or seven.

Variable Definitions:

Variable	Definition
Abnormal Accruals	Abnormal accruals based on the modified Jones model scaled by total assets
All Financial Covenants Stricter	Indicator equal to one if the financial covenants specified in a newly issued loan are stricter than the corresponding financial covenants in already outstanding loans
Any R&D	Indicator equal to one if R&D expenses are positive
Average Maturity	Value-weighted average maturity of outstanding debt
Business Segments	Number of business segments in which a firm operates
Cash Flow Sweeps	Number of asset sales sweeps, debt issuance sweeps, equity issuance sweeps, insurance proceeds sweeps, and excess cash flow sweeps
Cash Flow Volatility	Standard deviation of quarterly cash flows from operations during the prior three years scaled by total assets
Capital Leases (%)	Fraction of a firm's total debt classified as "Capital Leases" in Capital IQ
Commercial Paper (%)	Fraction of a firm's total debt classified as "Commercial Paper" in Capital IQ
Credit Rating	S&P issuer credit rating of the borrower (including "no rating")
Debt Heterogeneity	$1 - HHI_{j,t} = 1 - (\sum_{i=1}^{7} h_{j,t,i}^2 - 1/7)/(1 - 1/7)$ where $h_{j,t,i}$ for $i = 1, 2, 3, \ldots, 7$ is the fraction of debt type i – Senior Bonds and Notes, Drawn Credit Lines, Term Loans, Subordinated Bonds and Notes, Capital Leases, Commercial Paper, and Other Debt – in firm j's total debt at time t
Debt Structure Complexity	Number of different debt instruments in a firm's existing debt structure
Dividend Payer	Indicator equal to one if the firm pays out cash-dividends
Drawn Credit Lines (%)	Fraction of a firm's total debt classified as "Drawn Credit Lines" in Capital IQ
EBITDA, Capex, and Dividend Restrictions	Number of covenants specifying minimum EBITDA and maximum capital expenditure and dividend thresholds
EBITDA Data Available	Indicator equal to one if data on the firm's EBITDA prior to the bankruptcy filing is available
Economic Recession	Indicator equal to one if the firm files for bankruptcy during a recession period as defined by the National Bureau of Economic Research
Forecast EPS Growth	Median analyst five-year EPS growth forecast at loan issuance computed at the industry level defined by the first two digits of the borrower's SIC code
Face Value	Face value of the debt instrument
Interest Spread	Difference between the interest rate on a loan and the LIBOR
Inverse Mills Ratio	Inverse Mills ratio based on the first-stage of the Heckman selection model
Investment Grade	Indicator equal to one if the firm has an investment grade credit rating ($BBB-$ or better)
Leverage	Long-term debt plus debt in current liabilities divided by total assets

Variable	Definition
Leverage and Net Worth Restrictions	Number of covenants specifying maximum debt to EBITDA, senior debt to EBITDA, debt to assets, debt to tangible net worth, debt to equity, leverage, senior leverage, and loan to value requirements as well as minimum equity to assets, net worth, tangible net worth, and net worth to total assets requirements
Loan Purpose	Corporate purposes, debt repayment, takeover, working capital, or undeclared
Loan Type	Term loan, revolver-line $<$ one year, revolver-line $\geq$ one year, 364-day facility, or undeclared
Long-Term Debt Maturing	Indicator equal to one if at least 5% of a firm's long-term debt matures during the year
Low Leverage	Indicator equal to one if the firm's leverage is lower than the sample median
Majority of Financial Covenants Stricter	Indicator equal to one if the majority of financial covenants specified in a newly issued loan are stricter than the corresponding financial covenants in already outstanding loans
Market Adjusted Return	Annual stock return of the firm minus the return of the CRSP value-weighted market portfolio
Market-to-Book	Market value of equity plus book value of debt divided by total assets
Maturity	Maturity of the debt instrument
Maturity Heterogeneity	$1 - HHI_{j,t}^{Maturity} = 1 - (\sum_{i=1}^{5} h_{j,t,i}^2 - 1/5)/(1 - 1/5)$ where $h_{j,t,i}$ for $i = 1, 2, 3, 4, 5$ is the fraction debt in maturity category i – less than one year, one-to-three years, three-to-five years, five-to-ten years, and more than ten years – in firm j's total debt at time t
Maturity Information Missing	Indicator equal to one if information on the remaining maturity is missing for more than 10% of a firm's outstanding debt
Minimum Liquidity Requirements	Number of covenants that specify minimum interest coverage, fixed charge coverage, current ratio, debt service coverage, quick ratio, and cash interest coverage requirements
New Covenants	Number of covenants specified in a newly issued loan that are not already specified in outstanding loans of the same type
Number of Covenants	Number of covenants included in the debt contract
Number of Debt Types	Number of debt types in a firm's existing debt structure
Number of Lenders	Number of lenders participating in the loan syndicate
Obtain Loan	Indicator equal to one if the firm obtains a new loan during the year
Other Debt (%)	Fraction of a firm's total debt classified as "Other Debt" in Capital IQ
Performance Pricing	Indicator equal to one if the loan contract includes a performance pricing clause
Positive EBITDA	Indicator equal to one if the firm had positive EBITDA prior to the bankruptcy filing
Prearranged Resolution of Bankruptcy	Indicator equal to one if the bankruptcy is filed with a prearranged resolution plan
Prior Covenants	Total number of covenants already specified in a firm's existing loans and bonds outstanding at the time when a new loan or bond is issued. Covenants that are included in multiple outstanding loans or bonds of the borrower are counted only once.

Variable	Definition
Profitability	Earnings before interest, tax, depreciation, and amortization divided by total assets
Public Debt (%)	Percentage of senior bonds and notes, subordinated bonds and notes, and commercial paper in a firm's total existing debt
Rated	Indicator equal to one the firm has an S&P issuer credit rating
Relationship Bank	Indicator equal to one if any of the lead arrangers of the loan has been a lead arranger of any previous loan obtained by the borrower during the five years prior to the loan issuance date
R&D/Total Assets	R&D expenses divided by total assets (equal to zero if R&D expenses are missing)
Sales Growth	Realized annual growth rate of sales
Senior Bonds and Notes (%)	Fraction of a firm's total debt classified as "Senior Bonds and Notes" in Capital IQ
Senior Debt (%)	Percentage of senior debt in a firm's total existing debt
Stricter Financial Covenants	Number of financial covenants specified in a newly issued loan that are stricter than the corresponding financial covenants specified in already outstanding loans
Subordinated Bonds and Notes (%)	Fraction of a firm's total debt classified as "Subordinated Bonds and Notes" in Capital IQ
Tangibility	Net property, plant, and equipment divided by total assets
Term Loans (%)	Fraction of a firm's total debt classified as "Term Loans" in Capital IQ
Total Assets	Book value of total assets
Transparent Accounting	Indicator equal to one if the firm's abnormal accruals are smaller than the sample median

List of Covenants

Type of Covenant	(1) Number of Loans with Covenant	(2) Fraction of Loans with Covenant
Minimum Liquidity Requirements:		
Minimum Interest Coverage	1,161	0.294
Minimum Fixed Charge Coverage	1,062	0.269
Minimum Current Ratio	194	0.049
Minimum Debt Service Coverage	92	0.023
Minimum Quick Ratio	34	0.009
Minimum Cash Interest Coverage	17	0.004
Cash Flow Sweeps:		
Asset Sales Sweep	1,069	0.271
Debt Issuance Sweep	876	0.222
Equity Issuance Sweep	765	0.194
Insurance Proceeds Sweep	754	0.191
Excess Cash Flow Sweep	473	0.120
Leverage and Net Worth Restrictions:		
Maximum Debt to EBITDA	1,811	0.459
Minimum Net Worth	497	0.126
Maximum Leverage Ratio	400	0.101
Maximum Senior Debt to EBITDA	360	0.091
Minimum Tangible Net Worth	295	0.075
Maximum Debt to Tangible Net Worth	139	0.035
Maximum Debt to Equity	10	0.003
Maximum Senior Leverage	8	0.002
Maximum Loan to Value	3	0.001
Minimum Net Worth to Total Assets	1	0.000
EBITDA, Capex, and Dividend Restrictions:		
Dividend Restrictions	2,289	0.580
Maximum Capex	739	0.187
Minimum EBITDA	259	0.066

Coefficient Estimates and Standard Errors for Table 3, Panel A

This table presents the coefficient estimates and standard errors for the *Firm*, *Debt Structure*, and *Loan Characteristics* included in the regressions reported in Table 3, Panel A. All regressions are specified as in Table 3, Panel A.

Panel A: OLS Regressions	(1)	(2)	(3)	(4)	(5)	(6)
Debt Heterogeneity	0.741***	0.797***	0.814***	0.850***	0.692***	0.765**
	(0.236)	(0.270)	(0.280)	(0.298)	(0.263)	(0.317)
Leverage			-0.828	0.027	0.113	1.068
			(1.454)	(1.469)	(1.410)	(1.590)
Leverage^2			1.144	0.642	-0.069	-0.248
			(2.023)	(2.037)	(2.016)	(2.399)
Ln(Total Assets)			-0.439**	-0.303	-0.354*	-0.475**
			(0.219)	(0.225)	(0.193)	(0.236)
Tangibility			0.093	-0.256	-1.122	-0.108
			(1.176)	(1.181)	(1.042)	(1.135)
Profitability			1.554	1.916*	1.442	2.533**
			(1.117)	(1.121)	(0.997)	(1.036)
Market-to-Book			-0.358***	-0.347***	-0.276**	-0.305**
			(0.123)	(0.121)	(0.113)	(0.127)
Cash Flow Volatility			-4.423	-5.032	-1.381	-1.134
			(3.487)	(3.433)	(3.060)	(3.344)
R&D/Total Assets			-1.551	-1.832	-1.238	2.553
			(7.663)	(7.433)	(5.614)	(6.645)
Dividend Payer			0.457*	0.376	0.066	-0.161
			(0.249)	(0.243)	(0.221)	(0.236)
Abnormal Accruals			-0.013	-0.010	0.009	0.015
			(0.015)	(0.015)	(0.015)	(0.015)
Forecast EPS Growth			-0.039	-0.032	-0.029	-0.020
			(0.027)	(0.027)	(0.023)	(0.024)
Sales Growth			0.021	-0.022	-0.093	0.043
			(0.251)	(0.246)	(0.238)	(0.250)
Market Adjusted Return			-0.001	0.013	0.022	-0.140
			(0.106)	(0.106)	(0.098)	(0.106)
Business Segments			0.095**	0.101**	0.064	0.091*
			(0.044)	(0.045)	(0.045)	(0.049)
Business Segments Missing			0.570*	0.589**	0.586**	0.640*
			(0.297)	(0.298)	(0.280)	(0.358)
Average Maturity				-0.025	-0.014	-0.016
				(0.016)	(0.013)	(0.014)
Maturity Heterogeneity				-0.116	0.037	-0.166
				(0.269)	(0.241)	(0.269)
Maturity Information Missing				-0.076	-0.153	-0.221*
				(0.138)	(0.119)	(0.133)
Senior Debt (%)				0.242	0.360	0.309
				(0.403)	(0.368)	(0.410)
Debt Structure Complexity				0.006	-0.009	0.003
				(0.021)	(0.018)	(0.021)
Prior Covenants				-0.094***	-0.085***	-0.100***
				(0.016)	(0.014)	(0.015)
Ln(Face Value)					0.233***	0.188*
					(0.078)	(0.105)
Ln(Maturity)					-0.109	-0.180
					(0.137)	(0.192)
Interest Spread					0.005***	0.005***
					(0.001)	(0.001)
Performance Pricing					2.387***	2.597***
					(0.126)	(0.154)
Number of Lenders					0.026***	0.029***
					(0.007)	(0.009)
Relationship Bank					-0.044	-0.058
					(0.087)	(0.099)

Coefficient Estimates and Standard Errors for Table 3, Panel B

This table presents the coefficient estimates and standard errors for the *Firm*, *Debt Structure*, and *Loan Characteristics* included in the regressions reported in Table 3, Panel B. All regressions are specified as in Table 3, Panel B.

Panel B: Poisson Regressions	(1)	(2)	(3)	(4)	(5)	(6)
Debt Heterogeneity	0.220***	0.263***	0.270***	0.287***	0.301***	0.388***
	(0.069)	(0.082)	(0.089)	(0.099)	(0.094)	(0.113)
Leverage			-0.113	0.074	-0.108	0.369
			(0.401)	(0.410)	(0.421)	(0.503)
Leverage^2			0.037	-0.059	-0.225	-0.732
			(0.560)	(0.563)	(0.583)	(0.693)
Ln(Total Assets)			-0.077	-0.041	-0.115	-0.170**
			(0.067)	(0.069)	(0.075)	(0.083)
Tangibility			-0.052	-0.153	-0.498	-0.139
			(0.358)	(0.362)	(0.326)	(0.371)
Profitability			0.503	0.595	0.388	1.054**
			(0.382)	(0.389)	(0.376)	(0.426)
Market-to-Book			-0.092**	-0.083**	-0.063	-0.095**
			(0.040)	(0.040)	(0.043)	(0.047)
Cash Flow Volatility			-1.366	-1.495	-0.512	-0.892
			(0.986)	(0.985)	(0.954)	(1.163)
R&D/Total Assets			-0.196	-0.330	-0.123	-0.007
			(2.176)	(2.169)	(1.971)	(2.573)
Dividend Payer			0.152**	0.127*	0.018	-0.025
			(0.073)	(0.072)	(0.069)	(0.080)
Abnormal Accruals			-0.006	-0.005	0.003	0.003
			(0.005)	(0.005)	(0.005)	(0.006)
Forecast EPS Growth			-0.012	-0.010	-0.010	-0.005
			(0.009)	(0.009)	(0.008)	(0.008)
Sales Growth			-0.052	-0.070	-0.077	-0.042
			(0.076)	(0.077)	(0.078)	(0.088)
Market Adjusted Return			0.009	0.014	0.007	-0.034
			(0.025)	(0.025)	(0.026)	(0.030)
Business Segments			0.023	0.025	0.011	0.022
			(0.015)	(0.015)	(0.015)	(0.018)
Business Segments Missing			0.201*	0.196*	0.160	0.096
			(0.109)	(0.111)	(0.113)	(0.128)
Average Maturity				-0.008	-0.005	-0.003
				(0.005)	(0.005)	(0.005)
Maturity Heterogeneity				-0.057	-0.014	-0.119
				(0.089)	(0.086)	(0.099)
Maturity Information Missing				-0.025	-0.052	-0.063
				(0.045)	(0.044)	(0.051)
Senior Debt (%)				0.036	0.042	-0.004
				(0.109)	(0.105)	(0.115)
Debt Structure Complexity				0.004	-0.002	0.001
				(0.009)	(0.008)	(0.009)
Prior Covenants				-0.018***	-0.018***	-0.023***
				(0.005)	(0.004)	(0.005)
Ln(Face Value)					0.133***	0.135***
					(0.033)	(0.046)
Ln(Maturity)					-0.117**	-0.095
					(0.048)	(0.072)
Interest Spread					0.002***	0.002***
					(0.000)	(0.000)
Performance Pricing					0.948***	1.052***
					(0.054)	(0.073)
Number of Lenders					0.005**	0.006**
					(0.002)	(0.003)
Relationship Bank					0.004	0.014
					(0.033)	(0.038)

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Table 1: Summary Statistics

This table presents summary statistics for the sample of 3,944 loans obtained by 1,409 U.S. firms between 2001 and 2010. Firm and debt structure characteristics are measured at the end of the fiscal year preceding the loan issuance date. Loan characteristics are measured at issuance. All variables are defined in the appendix.

	(1)	(2)	(3)	(4)
Variable	N	Mean	Median	Std. Dev.
Firm Characteristics:				
Total Assets (in USD million)	3,944	6,382	1,428	16,734
Leverage	3,944	0.29	0.26	0.18
Tangibility	3,944	0.33	0.26	0.25
Profitability	3,944	0.14	0.13	0.08
Market-to-Book	3,944	1.70	1.47	0.80
Cash Flow Volatility	3,944	0.05	0.04	0.03
R&D/Total Assets	3,944	0.02	0.00	0.03
Abnormal Accruals	3,944	0.92	0.16	3.59
Forecast EPS Growth	3,944	14.11	15.00	3.59
Sales Growth	3,944	0.13	0.09	0.27
Market Adjusted Return	3,944	0.15	0.02	0.68
Business Segments	3,944	3.33	3.00	2.15
Dividend Payer	3,944	0.47	0.00	0.50
Rated	3,944	0.60	1.00	0.49
Investment Grade	2,373	0.50	0.00	0.50
Debt Structure Characteristics:				
Debt Heterogeneity	3,944	0.34	0.36	0.26
Senior Bonds and Notes (%)	3,944	0.45	0.46	0.39
Drawn Credit Lines (%)	3,944	0.21	0.02	0.32
Term Loans (%)	3,944	0.14	0.00	0.27
Subordinated Bonds and Notes (%)	3,944	0.10	0.00	0.23
Capital Leases (%)	3,944	0.04	0.00	0.15
Commercial Paper (%)	3,944	0.02	0.00	0.10
Other Debt (%)	3,944	0.04	0.00	0.12
Average Maturity (in years)	3,944	7.10	6.24	4.92
Maturity Heterogeneity	3,944	0.44	0.48	0.29
Senior Debt (%)	3,944	0.89	1.00	0.24
Debt Structure Complexity	3,944	7.18	6.00	5.64
Prior Covenants	3,944	9.08	7.00	7.65
Loan Characteristics:				
Face Value (in USD million)	3,944	510	245	812
Maturity (in months)	3,944	45.0	48.0	20.4
Interest Spread (in basis points)	3,944	172	150	128
Number of Covenants	3,944	3.37	3.00	3.05
Performance Pricing	3,944	0.58	1.00	0.49
Number of Lenders	3,944	9.09	7.00	8.25
Relationship Bank	3,944	0.53	1.00	0.50

Table 2: Debt Heterogeneity and Prearranged Resolutions of Bankruptcy

This table presents coefficient estimates of the relation between heterogeneity in firms' debt structures (*Debt Heterogeneity*) and the use of prearranged bankruptcy resolutions (*Prearranged Resolution of Bankruptcy*). All variables are defined in the appendix. The sample period is 2001 to 2010. Industry fixed effects are based on the first three digits of the firms' SIC codes. Standard errors are clustered at the industry level and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)
Dependent Variable	Prearranged Resolution of Bankruptcy	
	(OLS)	(Conditional Logit)
Debt Heterogeneity	-0.343**	-2.776**
	(0.132)	(1.348)
Ln(Total Assets)	0.028	0.630*
	(0.019)	(0.323)
Positive EBITDA	0.118	1.666**
	(0.081)	(0.772)
EBITDA Data Available	-0.099	12.870***
	(0.079)	(1.338)
Economic Recession	-0.006	-0.386
	(0.069)	(0.659)
Leverage	0.502***	3.016***
	(0.113)	(0.793)
Tangibility	0.376*	3.210**
	(0.193)	(1.624)
Profitability	0.039	-0.108
	(0.283)	(1.309)
Market-to-Book	-0.261***	-1.400***
	(0.059)	(0.411)
Cash Flow Volatility	-1.392*	-5.080
	(0.746)	(7.718)
R&D/Total Assets	3.773**	24.663**
	(1.773)	(12.022)
Dividend Payer	-0.136**	-2.715**
	(0.057)	(1.127)
Rated	-0.017	0.322
	(0.074)	(0.807)
Fixed Effects:		
Industry	Yes	Yes
R^2/pseudo R^2	0.518	0.341
N	150	96

Table 3: Debt Heterogeneity and the Number of Covenants in New Loans

This table presents coefficient estimates of the relation between heterogeneity in borrowers' existing debt structures (*Debt Heterogeneity*) and the number of covenants in newly issued loans (*Number of Covenants*). All variables are defined in the appendix. Industry × Year fixed effects are based on the year of the loan issuance and the Fama-French-12 industry classification of the borrower. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A: OLS Regressions	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Number of Covenants					
Debt Heterogeneity	0.741***	0.797***	0.814***	0.850***	0.692***	0.765**
	(0.236)	(0.270)	(0.280)	(0.298)	(0.263)	(0.317)
Control Variables:						
Firm Characteristics	No	No	Yes	Yes	Yes	Yes
Debt Structure Characteristics	No	No	No	Yes	Yes	Yes
Loan Characteristics	No	No	No	No	Yes	Yes
Fixed Effects:						
Firm	No	Yes	Yes	Yes	Yes	No
Industry × Year	No	Yes	Yes	Yes	Yes	Yes
Credit Rating	No	Yes	Yes	Yes	Yes	Yes
Loan Purpose	No	Yes	Yes	Yes	Yes	Yes
Loan Type	No	Yes	Yes	Yes	Yes	No
Firm × Loan Type	No	No	No	No	No	Yes
R^2	0.004	0.629	0.634	0.641	0.721	0.770
N	3,944	3,453	3,453	3,453	3,453	2,910

Panel B: Poisson Regressions	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Number of Covenants					
Debt Heterogeneity	0.220***	0.263***	0.270***	0.287***	0.301***	0.388***
	(0.069)	(0.082)	(0.089)	(0.099)	(0.094)	(0.113)
Control Variables:						
Firm Characteristics	No	No	Yes	Yes	Yes	Yes
Debt Structure Characteristics	No	No	No	Yes	Yes	Yes
Loan Characteristics	No	No	No	No	Yes	Yes
Fixed Effects:						
Firm	No	Yes	Yes	Yes	Yes	No
Industry × Year	No	Yes	Yes	Yes	Yes	Yes
Credit Rating	No	Yes	Yes	Yes	Yes	Yes
Loan Purpose	No	Yes	Yes	Yes	Yes	Yes
Loan Type	No	Yes	Yes	Yes	Yes	No
Firm × Loan Type	No	No	No	No	No	Yes
pseudo R^2	0.002	0.524	0.527	0.534	0.610	0.654
N	3,944	3,252	3,252	3,252	3,252	2,611

Table 4: Debt Heterogeneity and the Strictness and Types of Covenants in New Loans

This table presents coefficient estimates of the relation between heterogeneity in borrowers' existing debt structures (*Debt Heterogeneity*) and the strictness and types of covenants in newly issued loans. All variables are defined in the appendix. Industry × Year fixed effects are based on the year of the loan issuance and the Fama-French-12 industry classification of the borrower. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A: New & Stricter Covenants	(1)	(2)	(3)	(4)
Dependent Variable	New Covenants	Stricter Financial Covenants	Majority of Financial Covenants Stricter	All Financial Covenants Stricter
Debt Heterogeneity	0.640**	0.373***	0.186**	0.159**
	(0.279)	(0.144)	(0.075)	(0.068)
Control Variables:				
Firm Characteristics	Yes	Yes	Yes	Yes
Debt Structure Characteristics	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes
Fixed Effects:				
Firm	Yes	Yes	Yes	Yes
Industry × Year	Yes	Yes	Yes	Yes
Credit Rating	Yes	Yes	Yes	Yes
Loan Purpose	Yes	Yes	Yes	Yes
Loan Type	Yes	Yes	Yes	Yes
R^2	0.584	0.582	0.482	0.536
N	3,453	2,143	2,143	2,143

Panel B: Types of Covenants	(1)	(2)	(3)	(4)
Dependent Variable	Minimum Liquidity Requirements	Cash Flow Sweeps	EBITDA, Capex, and Dividend Restrictions	Leverage and Net Worth Restrictions
Debt Heterogeneity	0.113**	0.456***	0.130*	-0.007
	(0.056)	(0.159)	(0.075)	(0.072)
Control Variables:				
Firm Characteristics	Yes	Yes	Yes	Yes
Debt Structure Characteristics	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes
Fixed Effects:				
Firm	Yes	Yes	Yes	Yes
Industry × Year	Yes	Yes	Yes	Yes
Credit Rating	Yes	Yes	Yes	Yes
Loan Purpose	Yes	Yes	Yes	Yes
Loan Type	Yes	Yes	Yes	Yes
R^2	0.689	0.671	0.681	0.703
N	3,453	3,453	3,453	3,453

Table 5: Cross-Sectional Variation

This table presents coefficient estimates of the relation between heterogeneity in borrowers' existing debt structures (*Debt Heterogeneity*) and the number of covenants in newly issued loans (*Number of Covenants*). All variables are defined in the appendix. Industry × Year fixed effects are based on the year of the loan issuance and the Fama-French-12 industry classification of the borrower. 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)
Dependent Variable			Number of Covenants		
	(Rated Firms)	(All Firms)	(All Firms)	(All Firms)	(All Firms)
Debt Heterogeneity	1.748***	1.078***	1.365***	1.015***	0.986***
	(0.589)	(0.341)	(0.381)	(0.317)	(0.350)
Debt Heterogeneity	-1.599***	-1.208***			
× Investment Grade	(0.618)	(0.427)			
Debt Heterogeneity			-1.299***		
× Low Leverage			(0.396)		
Debt Heterogeneity				-0.606*	
× Transparent Accounting				(0.352)	
Debt Heterogeneity					-0.662
× Any R&D					(0.484)
Control Variables:					
Firm Characteristics	Yes	Yes	Yes	Yes	Yes
Debt Structure Characteristics	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes	Yes
Fixed Effects:					
Firm	Yes	Yes	Yes	Yes	Yes
Industry × Year	Yes	Yes	Yes	Yes	Yes
Credit Rating	Yes	Yes	Yes	Yes	Yes
Loan Purpose	Yes	Yes	Yes	Yes	Yes
Loan Type	Yes	Yes	Yes	Yes	Yes
R^2	0.720	0.722	0.722	0.722	0.721
N	2,196	3,453	3,453	3,453	3,453

Table 6: 2SLS IV Estimation

This table presents coefficient estimates of the relation between the maturing of long-term debt (*Long-Term Debt Maturing*) and the number of different types of debt in a firm's debt structure (*Number of Debt Types*) in column (1) and the results of a 2SLS instrumental variable regression regarding the relation between heterogeneity in borrowers' existing debt structures (*Debt Heterogeneity*) and the number of covenants in newly issued loans (*Number of Covenants*) in columns (2) and (3). All variables are defined in the appendix. Industry $\times$ Year fixed effects are based on the year of the loan issuance and the Fama-French-12 industry classification of the borrower. 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)
Dependent Variable	Number of Debt Types	Debt Heterogeneity (First Stage of 2SLS)	Number of Covenants (Second Stage of 2SLS)
Debt Heterogeneity			6.360**
			(3.168)
Long-Term Debt Maturing	0.098**	0.039***	
	(0.045)	(0.010)	
Control Variables:			
Firm Characteristics	Yes	Yes	Yes
Debt Structure Characteristics	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes
Fixed Effects:			
Firm	Yes	Yes	Yes
Industry $\times$ Year	Yes	Yes	Yes
Credit Rating	Yes	Yes	Yes
Loan Purpose	Yes	Yes	Yes
Loan Type	Yes	Yes	Yes
F-statistic on instrument	–	14.8	–
R^2	0.795	0.731	0.665
N	3,320	3,320	3,320

Table 7: Heckman Selection Model to Account for Firms' Choice to Obtain a Loan

This table presents the results of a Heckman selection model to account for firms' choice to obtain a loan when estimating the relation between heterogeneity in borrowers' existing debt structures (*Debt Heterogeneity*) and the number of covenants in newly issued loans (*Number of Covenants*). All variables are defined in the appendix. Industry $\times$ Year fixed effects are based on the year of the loan issuance and the Fama-French-12 industry classification of the borrower. 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)
Dependent Variable	Obtain Loan (First Stage Probit)	Number of Covenants (Second Stage OLS)
Debt Heterogeneity	-0.003	0.688***
	(0.064)	(0.205)
Public Debt (%)	-0.104**	
	(0.044)	
Inverse Mills Ratio		1.546*
		(0.808)
Control Variables:		
Firm Characteristics	Yes	Yes
Debt Structure Characteristics	Yes	Yes
Loan Characteristics	No	Yes
Fixed Effects:		
Firm	No	Yes
Industry $\times$ Year	Yes	Yes
Credit Rating	Yes	Yes
Loan Purpose	No	Yes
Loan Type	No	Yes
Three-Digit-SIC-Code	Yes	No
R^2	–	0.721
N	16,740	3,453

Internet Appendix to
"Debt Heterogeneity and Covenants"

Additional Robustness Tests

Table A.1: Excluding Loans without Reported Covenants

This table presents coefficient estimates of the relation between heterogeneity in borrowers' existing debt structures (*Debt Heterogeneity*) and the number of covenants in newly issued loans (*Number of Covenants*). Loans for which DealScan does not report any covenants are excluded from the analysis. All variables are defined in the appendix. Industry × Year fixed effects are based on the year of the loan issuance and the Fama-French-12 industry classification of the borrower. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A: OLS Regressions	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Number of Covenants					
Debt Heterogeneity	1.429***	0.785***	0.776***	0.925***	0.862***	0.865***
	(0.230)	(0.230)	(0.251)	(0.261)	(0.257)	(0.312)
Control Variables:						
Firm Characteristics	No	No	Yes	Yes	Yes	Yes
Debt Structure Characteristics	No	No	No	Yes	Yes	Yes
Loan Characteristics	No	No	No	No	Yes	Yes
Fixed Effects:						
Firm	No	Yes	Yes	Yes	Yes	No
Industry × Year	No	Yes	Yes	Yes	Yes	Yes
Credit Rating	No	Yes	Yes	Yes	Yes	Yes
Loan Purpose	No	Yes	Yes	Yes	Yes	Yes
Loan Type	No	Yes	Yes	Yes	Yes	No
Firm × Loan Type	No	No	No	No	No	Yes
R^2	0.020	0.774	0.778	0.783	0.791	0.833
N	2,875	2,331	2,331	2,331	2,331	1,923

Panel B: Poisson Regressions	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Number of Covenants					
Debt Heterogeneity	0.309***	0.153***	0.151***	0.193***	0.191***	0.216***
	(0.049)	(0.050)	(0.055)	(0.059)	(0.059)	(0.069)
Control Variables:						
Firm Characteristics	No	No	Yes	Yes	Yes	Yes
Debt Structure Characteristics	No	No	No	Yes	Yes	Yes
Loan Characteristics	No	No	No	No	Yes	Yes
Fixed Effects:						
Firm	No	Yes	Yes	Yes	Yes	No
Industry × Year	No	Yes	Yes	Yes	Yes	Yes
Credit Rating	No	Yes	Yes	Yes	Yes	Yes
Loan Purpose	No	Yes	Yes	Yes	Yes	Yes
Loan Type	No	Yes	Yes	Yes	Yes	No
Firm × Loan Type	No	No	No	No	No	Yes
pseudo R^2	0.006	0.768	0.773	0.776	0.783	0.828
N	2,875	2,331	2,331	2,331	2,331	1,923

Table A.2: Excluding Borrowers with Very High/Low Levels of Debt Heterogeneity

This table presents coefficient estimates of the relation between heterogeneity in borrowers' existing debt structures (*Debt Heterogeneity*) and the number of covenants in newly issued loans (*Number of Covenants*). In columns (1) and (2), observations for which the value of *Debt Heterogeneity* is larger than the 75th percentile of the distribution of *Debt Heterogeneity* in the full sample are excluded from the regression sample. In columns (3) and (4), observations for which the value of *Debt Heterogeneity* is smaller than the 25th percentile are excluded. All variables are defined in the appendix. Industry × Year fixed effects are based on the year of the loan issuance and the Fama-French-12 industry classification of the borrower. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A: OLS Regressions	(1)	(2)	(3)	(4)
Dependent Variable	Number of Covenants			
	(Excluding Top 25%)		(Excluding Bottom 25%)	
Debt Heterogeneity	1.034***	1.031**	0.868**	0.814*
	(0.382)	(0.450)	(0.379)	(0.441)
Control Variables:				
Firm Characteristics	Yes	Yes	Yes	Yes
Debt Structure Characteristics	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes
Fixed Effects:				
Firm	Yes	No	Yes	No
Industry × Year	Yes	Yes	Yes	Yes
Credit Rating	Yes	Yes	Yes	Yes
Loan Purpose	Yes	Yes	Yes	Yes
Loan Type	Yes	No	Yes	No
Firm × Loan Type	No	Yes	No	Yes
R^2	0.761	0.808	0.728	0.779
N	2,492	2,053	2,445	2,013

Panel B: Poisson Regressions	(1)	(2)	(3)	(4)
Dependent Variable	Number of Covenants			
	(Excluding Top 25%)		(Excluding Bottom 25%)	
Debt Heterogeneity	0.335**	0.399**	0.429***	0.437**
	(0.139)	(0.162)	(0.152)	(0.180)
Control Variables:				
Firm Characteristics	Yes	Yes	Yes	Yes
Debt Structure Characteristics	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes
Fixed Effects:				
Firm	Yes	No	Yes	No
Industry × Year	Yes	Yes	Yes	Yes
Credit Rating	Yes	Yes	Yes	Yes
Loan Purpose	Yes	Yes	Yes	Yes
Loan Type	Yes	No	Yes	No
Firm × Loan Type	No	Yes	No	Yes
pseudo R^2	0.651	0.709	0.617	0.661
N	2,302	1,829	2,258	1,770

Table A.3: Alternative Measures of Debt Heterogeneity

This table presents estimates of the relation between debt heterogeneity and the number of covenants based on four alternative measures. All variables are defined in the appendix. Industry × Year fixed effects are based on the year of the loan issuance and the Fama-French-12 industry classification of the borrower. Standard errors are clustered at the firm level and reported in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Panel A: OLS Regressions	(1)	(2)	(3)	(4)
Dependent Variable	Number of Covenants			
Number of Debt Types $>$ 10%	0.263***			
	(0.087)			
No Debt Type $>$ 90%		0.164		
		(0.116)		
$1 - Gini$			1.834**	
			(0.806)	
$1 - HHI_{alt}$				0.872**
				(0.366)
Control Variables:				
Firm Characteristics	Yes	Yes	Yes	Yes
Debt Structure Characteristics	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes
Fixed Effects:				
Firm	Yes	Yes	Yes	Yes
Industry × Year	Yes	Yes	Yes	Yes
Credit Rating	Yes	Yes	Yes	Yes
Loan Purpose	Yes	Yes	Yes	Yes
Loan Type	Yes	Yes	Yes	Yes
R^2	0.721	0.720	0.721	0.721
N	3,453	3,453	3,453	3,453

Panel B: Poisson Regressions	(1)	(2)	(3)	(4)
Dependent Variable	Number of Covenants			
Number of Debt Types $>$ 10%	0.103***			
	(0.034)			
No Debt Type $>$ 90%		0.082*		
		(0.043)		
$1 - Gini$			0.832***	
			(0.292)	
$1 - HHI_{alt}$				0.370***
				(0.119)
Control Variables:				
Firm Characteristics	Yes	Yes	Yes	Yes
Debt Structure Characteristics	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes
Fixed Effects:				
Firm	Yes	Yes	Yes	Yes
Industry × Year	Yes	Yes	Yes	Yes
Credit Rating	Yes	Yes	Yes	Yes
Loan Purpose	Yes	Yes	Yes	Yes
Loan Type	Yes	Yes	Yes	Yes
pseudo R^2	0.610	0.609	0.610	0.610
N	3,252	3,252	3,252	3,252

Supplemental Analyses

Debt Heterogeneity and Other Loan Contract Terms

We investigate whether heterogeneity in firms' existing debt structures is related to loan contract terms other than covenants. Specifically, we examine how debt heterogeneity is related to the use of events of default clauses, collateral, and performance pricing clauses, as well as its relation to interest spreads.

Most debt contracts include an "Events of Default" section specifying the events triggering default. Nonetheless, the number of default clauses that are included in the contracts varies between firms (Li, Lou, and Vasvari (2015)). A declaration of insolvency, bankruptcy, or reorganization, the failure to pay principal or interest, and the violation of debt covenants are natural events of default. Common clauses, however, also include the failure to pay court judgments or the invalidation of debt guarantees provided by third parties. Including more default clauses in the contract provides the lenders with additional protection as more events are specified in which control rights are allocated to the creditors. Therefore, loan contracts of borrowers' with more heterogeneous debt structures may include a larger number of default clauses.

An alternative way to protect the lenders' interests is to collateralize the debt. If the debt is fully collateralized, the claimants may worry less about disagreement and coordination failure among different creditors. If, however, the lenders hold an unsecured claim, disagreement and coordination failure in case of distress is likely to be more costly. A higher level of debt heterogeneity may thus increase the likelihood that lenders demand that a loan be secured by collateral.

Rather than offering more protection in the form of additional covenants, default clauses, or collateral, the debt contract could also include a performance pricing clause or specify a higher interest rate. Hence, debt raised by firms with more heterogeneous debt structures may be more likely to include a performance pricing clause and to carry a higher interest spread.

Table A.4 presents regressions results relating debt heterogeneity to loan contract terms other than covenants. Column (1) shows the results regarding the number of events of default clauses.[40] Column (2) presents the results regarding the use of collateral. Column (3) displays the results pertaining to the use of performance pricing clauses. Column (4) shows the results regarding the interest spread on the loans. The coefficient estimates on *Debt Heterogeneity* are not statistically significant in any of the regressions.

[40]Information on events of default clauses is hand-collected from the firms' SEC filings.

The finding that debt heterogeneity is related to the use of covenants but not interest spreads is consistent with the theoretical arguments that form the basis of our empirical predictions. Our premise is that debt heterogeneity increases the expected cost of liquidity defaults, i.e., the expected dead-weight-loss arising from creditors' inability to coordinate on an efficient resolution plan. Because (some) losses can be imposed on creditors in case of default, managers (who act on behalf of shareholders) may have incentives to take actions that increase the risk of liquidity defaults (e.g., reduce liquidity buffers by making large dividend payouts) or decrease the assets' liquidation values (e.g., through asset substitution) if these actions entail a wealth transfer from creditors to shareholders.

To the extent that such actions reduce overall firm value, they are inefficient (in the sense that they reduce the total surplus that can be shared between shareholders and creditors). A major role of covenants is to address such inefficiencies by preventing managers from taking said actions (Tirole (2006)). Another inefficiency that covenants can address is that the individually optimal level of monitoring that creditors would choose in the absence of covenants may be lower than the efficient (i.e., socially optimal) level of monitoring (Rajan and Winton (1995)). The purpose of covenants is thus to reduce inefficiencies and, in doing so, increase the economic surplus created by the lending relationship.

The key argument underpinning our prediction that debt heterogeneity leads to more covenants (rather than higher interest spreads) is that debt heterogeneity increases the inefficiencies associated with liquidity defaults and that covenants can help reduce these inefficiencies. Covenants thus allow borrowers and creditors to increase the total surplus that they can share. Increasing the interest rate on the loan would not have the same effect: Absent further assumptions on the impact of the interest rate on creditors' and borrowers' subsequent behavior, a change in the interest rate would not change the total surplus but only how the surplus is split between the contracting parties. Adjusting covenants in response to debt heterogeneity thus pareto-dominates adjusting interest rates.

Table A.4: Debt Heterogeneity and Other Loan Contract Terms

This table presents coefficient estimates of the relation between heterogeneity in borrowers' existing debt structures (*Debt Heterogeneity*) and loan contract terms other than covenants. All variables are defined in the appendix. Industry $\times$ Year fixed effects are based on the year of the loan issuance and the Fama-French-12 industry classification of the borrower. 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)
Dependent Variable	Default Clauses	Collateral	Performance Pricing	Interest Spread
Debt Heterogeneity	0.290	0.011	0.007	4.927
	(0.289)	(0.041)	(0.053)	(8.275)
Control Variables:				
Firm Characteristics	Yes	Yes	Yes	Yes
Debt Structure Characteristics	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes
Fixed Effects:				
Firm	Yes	Yes	Yes	Yes
Industry $\times$ Year	Yes	Yes	Yes	Yes
Credit Rating	Yes	Yes	Yes	Yes
Loan Purpose	Yes	Yes	Yes	Yes
Loan Type	Yes	Yes	Yes	Yes
R^2	0.744	0.824	0.583	0.824
N	1,634	2,264	3,453	3,453

Debt Heterogeneity and Bond Contract Terms

Throughout the paper, we have examined the relation between *Debt Heterogeneity* and covenants in a sample of corporate loans. However, the predictions developed in Section 2 are not specific to loans and should apply to debt contracts in general. We thus construct a sample of 2,193 newly issued corporate bonds using the Mergent Fixed Income Securities Database. We present summary statistics for the sample of new bonds in Table A.5. The data on the characteristics of these bonds are matched with information on the issuing firms' existing debt structures as in the loan sample. Finally, we regress the different bond contract terms on *Debt Heterogeneity*. As firms issue bonds less frequently than loans – so that there is less within-firm variation of *Debt Heterogeneity* and bond contract terms – we do not include firm fixed effects but rather industry$\times$year-interaction fixed effects based on first two digits of the firms' SIC codes and the years during which the bonds are issued.

Table A.6 displays the results. We find that bonds issued by firms with higher levels of *Debt Heterogeneity* contain a larger number of covenants and more default clauses. However, there is no evidence of a positive association between *Debt Heterogeneity* and the use of cross-default clauses. There is also no evidence of a significant association with yield spreads.

Table A.5: Summary Statistics for the Bond Sample

This table presents summary statistics for 2,193 bonds issued by 510 U.S. firms between 2001 and 2010. Firm and debt structure characteristics are measured at the end of the fiscal year preceding the bond issuance date. Bond characteristics are measured at issuance. All variables are defined in the appendix.

	(1)	(2)	(3)	(4)
Variable	N	Mean	Median	Std. Dev.
Firm Characteristics:				
Total Assets (in USD million)	2,193	29,354	13,135	43,637
Leverage	2,193	0.32	0.30	0.15
Tangibility	2,193	0.38	0.35	0.24
Profitability	2,193	0.14	0.14	0.07
Market-to-Book	2,193	1.77	1.48	0.81
Cash Flow Volatility	2,193	0.04	0.04	0.02
R&D/Total Assets	2,193	0.01	0.00	0.02
Abnormal Accruals	2,166	0.66	0.17	3.65
Forecast EPS Growth	2,193	13.05	13.85	3.72
Sales Growth	2,193	0.11	0.07	0.27
Market Adjusted Return	2,193	0.08	0.02	0.41
Business Segments	2,193	4.50	4.00	2.70
Dividend Payer	2,193	0.74	1.00	0.44
Rated	2,193	0.99	1.00	0.09
Investment Grade	2,174	0.71	1.00	0.45
Debt Structure Characteristics:				
Debt Heterogeneity	2,193	0.42	0.46	0.23
Senior Bonds and Notes (%)	2,193	0.65	0.72	0.29
Drawn Credit Lines (%)	2,193	0.07	0.00	0.15
Term Loans (%)	2,193	0.08	0.00	0.16
Subordinated Bonds and Notes (%)	2,193	0.07	0.00	0.18
Capital Leases (%)	2,193	0.02	0.00	0.06
Commercial Paper (%)	2,193	0.07	0.00	0.13
Other Debt (%)	2,193	0.05	0.00	0.12
Average Maturity (in years)	2,193	11.42	8.69	8.90
Maturity Heterogeneity	2,193	0.61	0.65	0.24
Senior Debt (%)	2,193	0.92	1.00	0.18
Debt Structure Complexity	2,193	12.90	12.00	7.06
Prior Covenants	2,193	10.22	8.00	6.62
Bond Characteristics:				
Face Value (in USD million)	2,193	414	300	430
Maturity (in months)	2,193	121.5	120.0	81.4
Yield Spread (in basis points)	2,193	254	198	200
Number of Covenants	2,193	5.24	5.00	4.41
Number of Default Clauses	1,111	5.59	5.00	1.06
Cross-Default Clause	1,111	0.28	0.00	0.45

Table A.6: Debt Heterogeneity and Bond Contract Terms

This table presents coefficient estimates of the relation between heterogeneity in borrowers' existing debt structures (*Debt Heterogeneity*) and the contract terms of newly issued corporate bonds. All variables are defined in the appendix. Industry × Year fixed effects are based on the year of the bond issuance and the first two digits of the borrowers' SIC codes. 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)
Dependent Variable	Number of Covenants	Default Clauses	Cross Default Clause	Yield Spread
Debt Heterogeneity	1.075**	0.483*	0.122	-6.238
	(0.436)	(0.259)	(0.113)	(19.330)
Control Variables:				
Firm Characteristics	Yes	Yes	Yes	Yes
Debt Structure Characteristics	Yes	Yes	Yes	Yes
Bond Characteristics	Yes	Yes	Yes	Yes
Fixed Effects:				
Industry × Year	Yes	Yes	Yes	Yes
Credit Rating	Yes	Yes	Yes	Yes
R^2	0.817	0.721	0.725	0.712
N	2,078	1,032	1,032	2,078

Heterogeneity Within and Between Public and Private Debt

The existing literature suggests that conflicts of interest, free-rider problems, and coordination failure tend to be more severe among the owners of public debt than among the owners of private debt (e.g., Gertner and Scharfstein (1991), Asquith, Gertner, and Scharfstein (1994)). Hence, one may expect that heterogeneity within a borrower's public debt is more strongly related to the use of covenants than heterogeneity within a borrower's private debt. To complement our analyses, we thus examine heterogeneity within each borrower's public debt, within the private debt, and between the public and private debt separately. For this purpose, we construct three additional measures: *Public Debt Heterogeneity*, *Private Debt Heterogeneity*, and *Public/Private Debt Heterogeneity*.

We begin by computing the normalized Herfindahl-Hirschman Index (HHI) within a firm's public debt as

$$HHI_{j,t}^{Public\ Debt} = \frac{\sum_{i=1}^{3} h_{j,t,i}^2 - \frac{1}{3}}{1 - \frac{1}{3}}, \tag{A1}$$

where $h_{j,t,i}$ for $i = 1, 2, 3$ is the fraction of debt type i in firm j's total public debt at the end of year t. The three types of public debt in our data are senior bonds and notes, subordinated bonds and notes, and commercial paper. Similarly, we compute the normalized HHI within each firm's private debt, $HHI_{j,t}^{Private\ Debt}$, based on the three types of private debt in our data: drawn credit lines, term loans, and capital leases. We further compute the normalized HHI between each firm's public and private debt as

$$HHI_{j,t}^{Public/Private\ Debt} = \frac{\sum_{i=1}^{2} h_{j,t,i}^2 - \frac{1}{2}}{1 - \frac{1}{2}}, \tag{A2}$$

where $h_{j,t,1}$ is the fraction of public debt, and $h_{j,t,2}$ is the fraction of private debt in firm j's total public and private debt at the end of year t. We then define[41]

$$Public\ Debt\ Heterogeneity_{j,t} \equiv 1 - HHI_{j,t}^{Public\ Debt}, \tag{A3}$$

$$Private\ Debt\ Heterogeneity_{j,t} \equiv 1 - HHI_{j,t}^{Private\ Debt}, \tag{A4}$$

[41] We set *Public Debt Heterogeneity* $= 0$ if a firm does not have any outstanding bonds, notes, or commercial paper, *Private Debt Heterogeneity* $= 0$ if a firm does not have any drawn credit lines, term loans, or capital leases, and *Public/Private Debt Heterogeneity* $= 0$ if a firm only has debt classified as "other debt" by Capital IQ.

and

$$\textit{Public/Private Debt Heterogeneity}_{j,t} \equiv 1 - \textit{HHI}_{j,t}^{\textit{Public/Private Debt}}. \tag{A5}$$

Finally, we repeat our regression analyses using the three measures of heterogeneity within and between a borrower's public and private debt. Table A.7 presents the results. All regressions are specified as in column (5) in Panel A of Table 3. As before, we do not report the coefficient estimates and standard errors of the control variables in order to conserve space.

We find evidence of a positive relation between heterogeneity within a firm's public debt and the use of covenants: The coefficient estimate on *Public Debt Heterogeneity* in column (1) is positive and statistically significant at the 5% level. The coefficient estimates on *Private Debt Heterogeneity* in column (2) and on *Public/Private Debt Heterogeneity* in column (3) are not statistically different from zero. These results are consistent with the notion that conflicts of interest, free-rider problems, and coordination failure are more likely to arise among the owners of heterogeneous public debt types than among the owners of private debt. Column (4), in which we include all three heterogeneity measures, confirms these findings. Finally, column (5) shows that *Debt Heterogeneity*, the independent variable of interest throughout the paper, is not subsumed by *Public Debt Heterogeneity*. The coefficient estimate on *Debt Heterogeneity* is positive and statistically significant (albeit only at the 10% level) while the coefficient estimate on *Public Debt Heterogeneity* is not statistically different from zero.

Table A.7: Heterogeneity Within and Between a Borrower's Public and Private Debt

This table presents coefficient estimates of the relation between heterogeneity within and between borrowers' existing public and private debt and the number of covenants in newly issued loans (*Number of Covenants*). All variables are defined in the appendix. Industry × Year fixed effects are based on the year of the loan issuance and the Fama-French-12 industry classification of the borrower. 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)
Dependent Variable	Number of Covenants				
Debt Heterogeneity					0.559*
					(0.300)
Public Debt Heterogeneity	0.593**			0.630**	0.358
	(0.242)			*(0.245)*	*(0.281)*
Private Debt Heterogeneity		0.124		0.124	
		(0.229)		*(0.231)*	
Public/Private Debt Heterogeneity			0.245	0.263	
			(0.177)	*(0.178)*	
Control Variables:					
Firm Characteristics	Yes	Yes	Yes	Yes	Yes
Debt Structure Characteristics	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	Yes	Yes	Yes	Yes	Yes
Fixed Effects:					
Firm	Yes	Yes	Yes	Yes	Yes
Industry × Year	Yes	Yes	Yes	Yes	Yes
Credit Rating	Yes	Yes	Yes	Yes	Yes
Loan Purpose	Yes	Yes	Yes	Yes	Yes
Loan Type	Yes	Yes	Yes	Yes	Yes
R^2	0.721	0.720	0.720	0.721	0.721
N	3,453	3,453	3,453	3,453	3,453

Variable Definitions:

Variable	Definition
Collateral	Indicator equal to one if a debt instrument is backed by collateral
Cross Default Clause	Indicator equal to one if the debt contract includes a cross default clause
Default Clauses	Number of events of default clauses included in the debt contract
Gini	$Gini_{j,t} = \sum_{i=1}^{7} h_{j,t,i} (i-4)/3$. $h_{j,t,i}$ is the fraction of debt type i in firm j's total debt at time t, and $h_{j,t,i} \leq h_{j,t,k}$ for $i < k$
HHI_{alt}	Normalized HHI after aggregating term loans and drawn credit lines and treating accounts payable ("trade credit") as an additional debt type
No Debt Type $> 90\%$	Indicator equal to one if no type of debt individually accounts for more than 90% of total debt. [Note: Equal to $1 - EXCL90$, where $EXCL90$ is defined as in Colla, Ippolito, and Li (2013)]
Number of Debt Types $> 10\%$	Number of debt types in a firm's existing debt structure that account individually for at least 10% of the firm's total debt
Private Debt Heterogeneity	$1 - (\sum_{i=1}^{3} h_{j,t,i}^2 - 1/3)/(1 - 1/3)$. $h_{j,t,i}$ for $i = 1, 2, 3$ is the fraction of debt type i in firm j's private debt at time t
Public Debt Heterogeneity	$1 - (\sum_{i=1}^{3} h_{j,t,i}^2 - 1/3)/(1 - 1/3)$. $h_{j,t,i}$ for $i = 1, 2, 3$ is the fraction of debt type i in firm j's public debt at time t
Public/Private Heterogeneity	$1 - (\sum_{i=1}^{2} h_{j,t,i}^2 - 1/2)/(1 - 1/2)$. $h_{j,t,1}$ ($h_{j,t,2}$) is the fraction of public debt (private debt) in firm j's total public and private debt at time t
Yield Spread	Difference between the bond's yield at issuance and that of a Treasury bill with matched maturity

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