Insolvency Resolution and the Missing High Yield Bond Markets

Bo Becker
Stockholm School of Economics and Swedish House of Finance

Jens Josephson
Stockholm University

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Insolvency resolution and the missing high yield bond markets

Bo Becker¹, Jens Josephson²*

Abstract. In many countries, poorly functioning bankruptcy procedures force viable but insolvent firms to restructure out of court, where banks may have a bargaining advantage of other creditors. We model the choice of restructuring process and derive implications for the corporate mix of bank and bond financing. Empirical patterns match the model: inefficient bankruptcy in a country is associated with less bond issuance by risky, but not by safe, borrowers there. This pattern holds for both levels and changes in bankruptcy recovery. Our results establish a link between bankruptcy reform and corporate bond markets, especially high yield markets.

JEL categories: G32, G33, G21

¹ Stockholm School of Economics
² Stockholm University
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Most external financing to corporations is debt, and most corporate debt, in most countries, is bank loans. In a small number of countries, however, corporate bonds make up a large share of corporate financing. Prominent among these countries is the US: publicly listed US firms get a larger share of their financing from bonds than from loans. This is not typical elsewhere: for European publicly listed companies the amount of loans outstanding is twice the amount of bonds. For Asian firms, bank loans are even more dominant as a source of financing (see Figure 1).

This international variation in the corporate debt mix cannot easily be explained by models of bank loan-bond choice which focus on the superior monitoring ability of banks or fixed costs associated with bond issuance. These forces do not vary in an obvious way across countries, especially not on the scale that could plausibly cause these wide differences in debt mix. After all, creditors worry about repayment both in France and Canada, and banks presumably screen and monitor their borrowers with approximately the same technology in different countries (at least developed economies). Additionally, standard models struggle with the willingness of large firms to combine issuance of bonds with borrowing (Becker and Ivashina 2014).

We propose that differences in how insolvency and default is handled offer an explanation of both cross-firm and cross-country patterns in the use of bonds and loans. Countries exhibit substantial differences in how creditors in insolvent firms are treated. Average recovery rates for financial claimants in a relatively simple bankruptcy range from negligible to above 90% according to Djankov, Hart, McLiesh

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3 In the United States, non-financial corporate business had $3.2 trillion of loans (excluding mortgages) and $4.6 trillion of bonds and commercial paper outstanding at the end of 2014 (Flow of Funds 2014Q4). The amount of bonds outstanding was three times loans at the end of in 2010 in our sample of public US firms.

4 Superior monitoring models include Diamond (1991), Diamond (1984), Besanko and Kanatas (1993), Boot and Thakor (1997), Petersen and Rajan (1994), Rajan (1992) and Repullo and Suarez (1998). Fixed costs models include Bhagat and Frost (1986), Smith (1986), Blackwell and Kidwell (1988), and Carey et al. (1993). Our empirical tests do not cover monitoring outside of distress at all.
and Shleifer (2008). Such differences in bankruptcy recoveries can be traced to poor liquidation decisions by courts; sluggish and bureaucratic decision-making in firms during bankruptcy proceedings; legal delays; lack of funding while in bankruptcy; as well as the direct costs of the process, including fees to lawyers, administrators and professionals. Because of these problems with in-court procedures, insolvency is largely handled outside of court in many countries.

To understand the effects of poor bankruptcy outcomes on corporate debt markets, we model the effect of insolvency resolution on firms that can choose between two forms of debt -- bank loans and bonds -- and which can resolve insolvency in or out of court.

Our model works as follows. Banks dislike making large loans, whereas the bond market is indifferent to credit amounts. This favors bond financing, but the risk of distress may offset this effect. When a firm is insolvent, it either resolves the situation in bankruptcy or out of court. Out-of-court resolution produces more total value than bankruptcy, but sharing of the additional value depends on bargaining power, which in our model favors concentrated lenders (banks). This raises the interest rate bond holders require to fund risky firms.

Based on these forces, our model predicts that safe firms will issue bonds (to avoid paying high interest rates required by banks), but higher-risk firms, for which insolvency is more likely, issue bonds as long as bankruptcy is efficient. For less efficient bankruptcy regimes, however, risky firms are stuck with bank loans.

5 We use the term bankruptcy to refer to any in-court procedure for resolving insolvency. This corresponds to US terminology. Many countries use different names for different procedures (e.g. “Scheme of Arrangement” for a court-administered restructuring in the UK). The legal variations are many and complex, but in-court procedures tend to involve some ability to force a restructuring plan on reluctant creditors (a “cram down”), to overrule some contracts, and to dismiss prior debts.

6 See for example Jostarndt and Sautner (2010), who undertake a detailed study of distressed German firms. Germany has had low efficiency according to the World Bank measure we use: only 57% average creditor recovery in 2005. Jornstarndt and Sautner show that bankruptcy tends to result in liquidation, and that restructuring is frequently accomplished out of court. Davydenko and Franks (2008) show that in court procedures are used to resolve a higher share of distress cases in the UK than in Germany, and used for the lowest share of cases in France, in line with measures of bankruptcy efficiency.
Our model is consistent with the well-known fact that small firms never issue bonds (e.g., Johnson 1997 and Hale and Santos 2002). It also predicts that firms that issue bonds typically also have bank loans, i.e. firms will mix bonds and loans. Indeed, in our sample, 84% of firm-years with bonds outstanding also have bank debt on their balance sheet. This is inconsistent with many theories of corporate debt structure, which predict a bang-bang choice of bank loans or bonds.\(^7\) More importantly, our model also makes two novel predictions linking bankruptcy systems and corporate debt mixes: (1) low-risk firms are able to use bonds regardless of the quality of the bankruptcy system and (2) high-risk firms will issue bonds if the bankruptcy system works well, but have to rely on loans if the bankruptcy system works poorly (because firms find it expensive to compensate bondholders for being expropriated by banks when distress occurs). In a large panel of countries, we document that both cross-sectional differences in bankruptcy recovery rates and patterns around bankruptcy reforms are consistent with these predictions. Measures of bankruptcy recovery explain the debt mix of high-risk firms, but are much less correlated with the debt mix of safer firms.\(^8\)

We present several robustness tests of this main result. First, we address the concern that bankruptcy rules may be correlated with other institutions and laws that are important to bond markets, generating an omitted variable problem. We control for creditor rights, a key non-bankruptcy feature of debt markets, and also include standard measures of institutional quality. Results are similar. As a placebo test, we also show that payout ratios and equity issues are not related to bankruptcy recovery variables, confirming that the variable is not capturing some broad factor driving development of financial markets in general. Next, we document that alternative measures of the quality of in-court bankruptcy (we use the duration of court

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\(^7\) Our model is not unique in predicting a mix of debt types. Boot and Thakor (1997) discuss a possible extension of their model where firms “balance the benefits of bank monitoring and financial market information aggregation”. Hackbarth, Henessy and Leland (2007) also model a mix of bonds and loans.

\(^8\) This is also consistent with the pattern documented for US firms by Denis and Mihov (2003): safer US firms issue bonds whereas riskier firms borrow from banks or other lenders. Our result can be seen as an extension of this test to settings with a range of insolvency systems.
procedures and an indicator for excess liquidation of distressed firms) give similar results.

Finally, we use reforms of bankruptcy laws. Even if the level of bankruptcy recovery is correlated with some (unmeasured) institutional feature related to bond market development, reforms in bankruptcy law and practice, and the associated changes in recovery rates are less likely to be associated with contemporaneous changes in other features of the financial system. The data is rich in changes in the quality of bankruptcy, reflecting a global trend toward insolvency law reform. The motivation has typically been a political desire to make liquidation less frequent, inspired by the US experience with Chapter 11. The process of adapting and adjusting US legal concepts (such as debtor-in-possession financing) to new legal environments has proven technically challenging. Thus, the delay between a reform initiative and the resulting legal change has often been long and unpredictable. When we include country fixed effects, which absorb time-invariant cross-country differences, we find that improvements in bankruptcy tend to be associated with increases in the bond share of debt, especially for high-risk firms. These results are robust to including various macro-economic factors and their interactions with firm risk. In our view, this evidence based on changes in bankruptcy recovery, is the most convincing for an effect of bankruptcy system on corporate debt.

Our model abstracts from a large set of potential determinants of the size of bank loan and bond markets. For example, bond markets depend on transparency and liquidity and the existence of institutional investors (Bao, Pan and Wang 2011). However, the corporate bond market is well integrated internationally. Many bonds of European issuers are issued in the UK and many bonds of global issuers are issued in the US. Furthermore, legal formats (covenant structure, debentures etc.) tend to be standardized internationally, many corporate bonds are issued in just a handful of

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9 One example of the low speed typical of bankruptcy reform is offered by the lengthy process leading up to the launch of Chapter 11. A congressional commission introduced a legislative proposal for bankruptcy reform in 1973, but it took another five years before congress passed The Bankruptcy Reform Act. We discuss other bankruptcy reforms below.
international currencies, and many bond investors buy foreign-issued bonds. This limits the scope for issuers’ nationality to affect market liquidity and depth. Bankruptcy rules are different: insolvency is typically resolved in the home country.\textsuperscript{10} Thus, bankruptcy offers a possible source of cross-country variation in bond market development even if trading is organized in a global market.

\textbf{Chapter 11.} A prominent example of bankruptcy reform is the introduction of Chapter 11, which represents the beginning of the modern era of reforms to improve the use of bankruptcy as a tool for restructuring, not liquidation. The law was effective for bankruptcies filed after October 1, 1978, preceded a very large increase in high yield issuance, called “junk bonds” at the time, over the following decade. This timing is consistent with our theory: Chapter 11 came before the junk bond market boomed.\textsuperscript{11} Thus, our theory does offer an interpretation of the junk bond boom as follows: once the bankruptcy system in the US was capable of handling large, complex cases and producing high overall value for claimants, it became feasible to issue large amounts of corporate bonds, even for higher risk issuers. The (relatively) fast and efficient operation of Chapter 11 has developed over time: for example, questions were raised about absolute priority violations during the 1980-ies, but less so now (Bris, Welch and Zhu 2006; Bharath et al. 2014). Although this episode is consistent with our model, there are too many contemporaneous events for us to think of the junk bond era as a sharp test of our theory.\textsuperscript{12}

The paper is organized as follows. Section 1 reviews the previous literature on corporate default and the choice between bonds loans and bonds. Section 2 outlines our theoretical model. Section 3 derives the predictions of the theoretical model.

\textsuperscript{10} In many countries, this practice follows the Model Law on Cross-Border Insolvency promulgated by the United Nations Commission on International Trade Law (“UNCITRAL”). See http://www.uncitral.org/uncitral/en/uncitral_texts/insolvency.html for the initial 1997 model law and subsequent updates as well as a list of adopting countries. The European Union has different law, but embraces similar principles. There exist a few notable exceptions where firms have resolved distress abroad.

\textsuperscript{11} By our calculations, based on Mergent FISD data, the period 1983-1990 marked the first time high yield bonds constituted more than 10% of the value of corporate bonds issued in consecutive years.

\textsuperscript{12} See e.g. Hackbarth, Haselmann, and Schoenherr (2015) for a recent discussion of Chapter 11.
Section 4 describes our data. Section 5 presents our empirical findings and Section 5 concludes. Proofs of theoretical results, diagrams, and tables can be found in the Appendix.

1. **Related literature**

There are several theories of how default and insolvency impacts firms’ choice of debt mix. Gertner and Scharfstein (1991), Bolton and Scharfstein (1996), Berglöf and von Thadden (1994), Bolton and Freixas (2000) and Hege and Mella-Barral (2005) all incorporate the idea that dispersed creditors find it difficult to coordinate. Our model builds on this literature in that we focus on the role of creditor bargaining power in distress, but differs from most models in that we that assume concentrated creditors have a negotiating *advantage*. That is, we assume bank lenders to a distressed firm will do better than the firm’s bondholders. Philosophically, our assumption is close to Berglöf, Roland and von Thadden (2000) and Bris and Welch (2005), who model large creditors as strong vis-à-vis management. We make the parallel argument that large creditors may be strong vis-à-vis small creditors. One reason to make this assumption is the existence of scale economies in many processes that aim to improve bargaining power, such as the gathering of information. In our model, bondholders’ weakness is a result of their unwillingness to incur the cost of becoming informed. We provide some supporting evidence for bondholders’ weak ex-post bargaining position: we document that bondholders often suffer larger losses than banks in restructurings, holding seniority fixed. Our model also assumes that differences in bargaining power matter more outside of court. Indeed, the data supports this in that the difference between bonds and loan recoveries (holding seniority fixed) is much less pronounced in court-determined restructurings, such as Chapter 11.\(^\text{13}\)

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\(^\text{13}\) Welch (1997) proposes that bank loans tend to be senior - i.e. have strong priority in restructurings – precisely because banks have strong bargaining positions out of court. If banks had a junior claim in bankruptcy, they could use their strong ex-ante position to undertake rent-seeking activities outside (before) bankruptcy. See also Rajan (1992).
The closest paper to ours is Hackbarth, Henessy and Leland (2007). They examine how cross-country bankruptcy differences in violations of absolute priority (APR) affect debt structures. They link soft bankruptcy processes (large APR violations) to more reliance on bond financing, using German and British bankruptcy as examples. In our view, the data of Djankov et al. point toward total payoff levels, rather than how value is shared, as the first order empirical difference across bankruptcy regimes. Djankov et al. document very low aggregate recoveries from bankruptcy in many countries. If the overall payoff is low, sharing by necessity becomes less important. That said, APR violations might well be more important among the smaller set of countries with really good aggregate outcomes, such as the UK and the US. We cannot address these interesting questions with our data.\footnote{Bris, Welch and Zhu (2006) report that APR violations in Chapter 11 are a smaller than they used to be. The model of Hackbarth et al. thus predicts an increasing bank share for US corporates. Our data set is too short to allow a test of this.}

2. The theoretical model

A firm has demand for capital given by the function $D(r) = A - Br$, where $A, B > 0$ and $r$ is the interest rate. The firm can obtain financing either from a continuum of identical risk-neutral bond investors of measure $M > 0$ or from $n > 1$ identical risk-neutral banks with convex cost of capital. There are no other sources of financing.

Each bond investor is willing to provide one unit of capital as long the interest rate is not below the break-even rate $r^*$. The rationale for this is that the bond investment is a small fraction of each bond investor’s portfolio of assets.

We denote the firm’s demand at this interest rate by $D$ and assume $M > D > 0$, i.e. at bond-investors’ break-even interest rate, demand is positive and it can be fully satisfied by bond investors.

Denoting the loan amount from bank $i$ by $L_i$, we further assume each bank $i$ has a cost function of capital of the following form: $C(L_i) = L_i + cL_i^2/2$, where $c$ is a
positive constant.\textsuperscript{15} The convex cost function is meant to capture the idea that making large loans is costly. For example, large loans expose banks to unwanted idiosyncratic risks, which can be costly due to owners’ preferences, managerial risk aversion, or regulatory capital requirements.\textsuperscript{16}

The firm chooses which funding to accept. We assume that the interest rate is determined in a Cournot fashion. More precisely, banks simultaneously submit loan offers and the total is thereafter matched to the firm’s residual demand for financing, given that bond investors are willing to supply capital for any interest rate at least equal to their break-even rate. Denoting the firm’s inverse demand for capital by \( R(K) = (A - K)/B \) where \( K \) is the total amount of credit provided by banks and bond investors, the interest rate as a function of total bank lending, \( L \), can be written \( R(\max\{D, L\}) \). This function is flat at \( r^* \) for \( L \leq D \) and downward sloping for \( L > D \).

After the firm has been financed, its operations produce a cash flow. With probability \( 1 - q > 0 \) the cash flow is sufficient for the firm to repay its debts in full and with probability \( q > 0 \) the cash flow is insufficient to repay all debts and the firm defaults.\textsuperscript{17} The implicit assumption behind the demand function is that the firm’s managers (or owners) chose the debt mix in order to minimize the interest rate payments when the firm remains solvent. In contrast, how much is paid to various claimants in a default (where the owners get nothing) does not matter to the decision.

If the firm defaults, either an out-of-court restructuring (OOC) or an in-court bankruptcy procedure (BCY) takes place. We set the value of the firm in a BCY to zero, making seniority irrelevant, and assume an OOC generates a total value of \( K \sigma \).

\textsuperscript{15} The results hold also for more general demand and cost functions.

\textsuperscript{16} By considering a convex cost of capital but not formally modelling risk aversion we can simplify the analysis considerably. This also means that the model is consistent with other reasons for bank aversion to large loans (e.g. due to capital regulation).

\textsuperscript{17} For simplicity, we assume funding does not impact default risk. This situation could come about because the project pays off either zero or in full.
where \(0 < \sigma < 1\).\(^{18}\) Hence, the default event always implies a credit loss compared to no default, but an OOC is more efficient than a BCY.

An OOC requires active participation by at least one creditor. Active participation entails a small fixed cost \(f > 0\).\(^{19}\) This cost may represent costs of expert advice, time and effort required to participate actively, or more abstractly, coordination costs. Creditors incurring this cost will share the difference in firm value between an OOC and a BCY, \(K\sigma\), pro rata. Hence, in an OOC passive creditors will receive their bankruptcy payoff, whereas an active creditor in addition will receive her share of the incremental firm value, net of the fixed cost of participation.\(^{20}\)

Without loss of generality we set the risk-free to zero. We also assume \(cB \leq (n - 1)(1 - q)\), which is a sufficient condition for existence and uniqueness of the symmetric equilibria we will study. The intuition for this condition is that when the curvature of banks’ cost functions and the slope of the demand function are not too large, banks do not have incentives to make large deviations from the symmetric equilibrium candidate.

The structure of this game of perfect information is common knowledge and can be described as follows:

1. Banks simultaneously decide how much to lend to the firm.
2. Bond investors simultaneously decide whether to lend to the firm or not.
3. Nature decides whether the firm can repay its debt or not. If the firm is solvent, all debts are paid and the game ends.
4. If the firm is insolvent, all creditors simultaneously decide whether or not to actively participate in an OOC. If no creditor decides to participate, a BCY is

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\(^{18}\) Under additional parameter restrictions our results hold also for positive bankruptcy payoffs and either senior bank loans or bondholders and banks of equal priority.

\(^{19}\) We assume \(f < \min\left(\frac{\sigma r(n+1)}{2n^2}, \left(\frac{1-q}{q}\right)\frac{L^*}{q^2}\right)\), where \(L^*\) is defined below.

\(^{20}\) This could be motivated by a dynamic bargaining model where it is so costly or takes so long to present a revised out-of-court restructuring proposal that the discounted value of the firm is no greater than what would have been obtained in bankruptcy. In the theoretical takeover literature there are several examples of models where small shareholders accept offers below the post-takeover value per share. Among these are models where the bid is conditional on the squeeze-out threshold (Yarrow 1985; Amihud et al. 2004), models with debt-financing (Mueller and Panunzi 2004), asymmetric information (At et al. 2011), and mixed strategies of shareholders (Bebchuk 1989).
performed and the game ends. Otherwise, an OOC is performed, where passive creditors receive their BCY payoff of zero whereas active creditors in addition receive their share of the incremental firm value.

This structure implies the following timeline:

- **Time**
- **Banks offer loans**
- **Bonds are issued**
- **Nature determines if default**
- **If default, creditors decide on OOC**

A key element of this setup is that we assume that creditor bargaining power matters less in BCY than OOC. We have in mind the fact that BCY offers a highly structured environment whose formal rules tend to protect the integrity and order of claims, shares and organizes information among all parties, and protect priority among claims. By comparison, an OOC is much less organized. Gilson (1997) points to several features of bankruptcy that are especially beneficial for creditors with weak innate bargaining power, including rules that reduce creditors’ ability to block reorganization plans and mandatory disclosure. Such features of the bankruptcy law are widespread outside the US as well. For example, Djankov et al. (2008) report that 82% of countries have some form of automatic stay on a bankrupt firm’s assets.

The other key element in this model is that banks have stronger bargaining power than bond investors, captured by the nature of step 4 of the game. There are several reasons why concentrated creditors like banks are likely to be strong in out of court situations. Their advantage may reflect the fact that bank loans are held in more concentrated positions than bonds, providing banks stronger incentives to monitor than dispersed bondholders.\(^{21}\) Banks may also be better informed than other creditors. Loan agreements often include reporting covenants and visitation rights (which bonds rarely have). Bank loans often have more stringent default definitions,

\(^{21}\) Ivashina (2009) demonstrates how bank loan syndicates are designed to ensure that the lead bank has an incentive to be active.
meaning that defaults occur earlier for loans than for bonds, giving banks a first mover advantage in distress. Finally, banks tend to be experienced in handling distress, and typically have departments devoted to loan workouts.

Although plausible for the above reasons, the feature of our model that bondholders suffer in out-of-court restructurings is untested. We examine the assumption’s realism by comparing bond and bank loan outcomes in defaults that take place in and out of court. Using Moody’s Default and Recovery Database (DRD), which contains outcome data for all claimants in restructurings of rated entities in and out of court, we calculate the frequency with which recoveries deviate by more than 10% points from what would have obtained had absolute priority been respected. We restrict the sample to US firms because data coverage is best there. Figure 3 reports the frequency of deviations for senior bonds (i.e. bonds which are not subordinated) and (senior) bank loans in bankruptcy and out of court restructurings. Bonds are marginally more likely to experience APR violations in court (38% vs. 27%), perhaps reflecting factors such as banks’ willingness to offer DIP financing in Chapter 11. Out of court, however, bonds are much more likely than bank loans to suffer APR violations out of court. In this sample, APR violations are six times as common for bonds as for bank loans out of court. This evidence appears consistent with our assumption that OOC restructurings favor banks relative to bondholders.

[Figure 3 about here]

3. Theoretical results

We will look for a subgame-perfect equilibrium (SPE) in pure strategies of the above game, which is symmetric in banks’ strategies. We solve the game backwards.

In stage 4, provided bank loans of positive measure were provided in stage 1, the corresponding banks participate actively, but no other creditors.\footnote{If no bank loans of positive measure were provided in stage 1 (this does not occur on the equilibrium path), then the corresponding subgame has an equilibrium where a finite number of bondholders participate actively.} In particular,
bond investors do not find it in their interest to participate actively as their share of the additional firm value will always be smaller than the fixed cost of active participation. This implies that their break-even rate will be given by:

\[ r^* = q/(1 - q). \] (1)

In stage 2, if \( L \leq D \), any equilibrium must have a measure \( D - L \) of bond investors supplying one unit of capital each or the interest rate would be different from \( r^* \), implying a profitable deviation for some investors. If \( L > D \), no bond investor will lend to the firm since the interest rate will be below \( r^* \).

Given the above, the interest rate as of function of total bank lending will be flat and equal to bond-investors break-even rate, \( R(D) = \frac{q}{1-q} \), for \( L \leq D \), and decreasing and equal to the inverse demand function, \( R(L) = (A - L)/B \), for \( L > D \). A bank \( i \), lending \( L_i \) when the other banks lend a total of \( L_{-i} \) will thus earn expected profits of:

\[ U(L_i, L_{-i}) = (1 - q)(R(\max\{D, L\}) + 1)L_i + q(\max\{D, L\} \sigma L_i/L) - f - C(L_i). \] (2)

We will look for symmetric equilibria where all banks provide loans of equal size:

\[ \hat{L}_i \in \max_{L_i \geq 0} U(L_i, (n - 1)\hat{L}_i) \text{ for all } i. \] (3)

We proceed by maximizing function (2) with respect to \( L_i \) for a given \( L_{-i} \) and thereafter setting \( L_i = L/n \) for all \( i \). If financing is provided both from banks and bond investors, such that the demand for capital is \( D \) and the interest rate \( \frac{q}{1-q} \), the first-order condition implies a fraction of bank financing of:

\[ \frac{\hat{L}}{D} = \sqrt{q\sigma(n - 1)/cD} \] (4)

This expression is smaller than one provided \( D > t'' \), where \( t'' := q\sigma(n - 1)/c \). If we measure the size of the firm by how much capital it demands at the bond investors’ break-even rate, then \( t'' \) represents the largest firm that banks will finance fully.

If, on the other hand, \( D \leq t'' \), then there will be only bank financing. Because of the kink in the interest rate as a function of bank lending at the point where \( L = D \),
there are then two mutually exclusive cases. If $D < t'$, where $t' := \sigma n q B / (c B + 1 - q)$, banks supply more capital than $D$, giving an interest rate below $q / 1-q$. If $D \geq t'$, they provide exactly $D$ such that the interest rate is $q / 1-q$. The threshold $t'$ represents the largest firm such that the banks’ supply of funding is unaffected by the presence of bond investors.\(^{23}\)

**Proposition 1**: The symmetric equilibrium has only bank financing if $D \leq t''$, and both bank and bond financing if $D > t''$. Banks will thus provide financing to all firms, whereas the bond market will only be tapped by firms above a critical size.

**Proposition 2**: In the symmetric equilibrium, the interest rate is increasing in $D$ if $D < t'$ and constant at $q / 1-q$ if $D \geq t'$. Proposition 2 implies that firms that reach the critical size where they want to tap the bond market, will not experience a lower cost of debt.

Writing $A = a s$ and $B = b s$, so that $D(r) = s(a - b r)$ where $s > 0$ is a scale parameter and $a$ and $b$ are positive constants, we can analyze the effect of changes in firm size. Figure 2 illustrates how firm size affects bank lending, bond issuance, and the interest rate. Note that since $t' \leq t''$, there is an intermediate range of firm sizes with only bank financing where the equilibrium interest rate is given by bond investors’ break-even rate.\(^{24}\) From the point where the interest rate becomes horizontal, the banks’ pricing is limited by the bond market, but they still find it profitable to meet the firm’s entire demand for funds. At some point the funding demand is large enough that the banks become unwilling to satisfy the whole amount at the bond market rate (reflecting the convexity of banks’ costs). From this point, the bond market provides some financing.

[Figure 2 about here]

\(^{23}\) The three types of equilibria are derived and described in detail in the Appendix.

\(^{24}\) The inequality follows from our assumption that $c B \leq (n - 1)(1 - q)$.
By computing the partial derivatives of the equilibrium fraction of bank loans in the case with both bank and bond financing, we obtain local comparative statics of the share of bank lending in a straightforward fashion.

**Proposition 3:** If \( D > t'' \), the fraction of bank loans in the symmetric equilibrium is increasing in \( q \) and \( \sigma \) and decreasing in \( s \) and \( c \).

In words, the fraction of bank financing is increasing in the default probability and the additional OOC return, but decreasing in the size of the firm, the bankruptcy cost, and the convexity of the cost function.

Because the relative efficiency of restructuring is a key driver of our theory, it seems natural to imagine that the likelihood of insolvency would be a determinant of the firm’s credit mix. Taking the cross partial of the fraction of bank loans, we obtain the following result, which implies that the positive effect on the fraction of bank financing of increasing BCY efficiency is larger for firms with higher probability of default.

**Proposition 4:** If \( D > t'' \), the cross partial with respect to \( q \) and \( \sigma \) of the fraction of bank loans in the symmetric equilibrium is positive.

The key predictions of the model are thus that (a) small firms rely on bank debt whereas large firms rely on a combination of bank debt and bonds, (b) the cost of debt does not decrease when the firm obtains bond financing, (c) the use of bonds is increasing in the relative efficiency of formal bankruptcy proceedings, and (d), especially for high-risk firms. These are new predictions relative to standard models of bond and bank debt. The model is also consistent with several existing empirical patterns. For example, our theory can explain why large firms are so willing to shift between bond issuance and bank borrowing, as Becker and Ivashina (2014) and Adrian, Colla and Shin (2012) document for US firms. In our theory, the marginal cost of each kind of debt is the same for (many) large firms, so that willingness to substitute based on small differences in price is precisely what we should expect.
4. Data

We collect data on restructuring payoffs for all different claimants in bankruptcies and out-of-court restructurings in Moody’s Default and Recovery (DRD) database. The sample covers defaults occurring between 1995 and 2011. For each type of resolution (bankruptcy or restructuring out of court), claim size and recovery amount is reported for each security or class of securities (a security in this context may be a bank loan). Several securities may be of equal priority. Actual recovery is compared to hypothetical recovery if the absolute priority rule (APR) had been respected. The seniority structure reported in DRD reflects structural as well as contractual subordination. We then calculate the frequency with which recovery rates deviate from APR recovery by at least 10%. The sample covers a total of 698 events for 659 firms (39 firms defaulted twice). Payoffs are reported for a total of 2,644 securities, of which 2,191 were involved in bankruptcies and 453 in out-of-court restructurings. This data is used for Figure 3.

From the World Bank (2006), we collect a “composite bond market development” index for robustness tests.

We collect firm data from CapitalIQ. The data covers 2000-2011, and firms from 44 countries. We exclude financial firms and utilities. Data collected from CapitalIQ include income statement and balance sheet data, S&P’s industry classification (138 unique values), the volatility of the weekly stock price changes for the previous year, the trading volume of a firm’s shares (annual, as a share of market capitalization) and corporate credit ratings from Moody’s and S&P.

Leverage is the ratio of debt (book value) to assets (book value). Market leverage is the ratio of book value of debt to the sum of market value of equity and book value of debt. Market capitalization is the log of the firm’s market value of equity.

25 The 35 countries which are represented by more than 100 firm-year observations in our sample are: Australia, Austria, Belgium, Canada, Chile, Denmark, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Italy, Japan, Korea, Luxembourg, Malaysia, Mexico, Netherlands, New Zealand, Norway, Philippines, Poland, Portugal, Russia, South Africa, Spain, Sweden, Switzerland, Taiwan, Turkey, United Kingdom, United States.
equity measured in US dollars. Book to market is the ratio of book value of equity to market value. Return on assets (ROA) is the ratio of EBITDA to sales. Cash over assets is total liquid assets divided by lagged book assets.

We also collect measures of firms’ debt structures. We define the bond share as the ratio of bonds (book value) to total debt. For bonds, we use commercial paper and bonds. We also use the bank debt share, which combines term loans and revolving credit lines. For most purposes, we do not differentiate between commercial paper and longer-term bonds, and just aggregate (commercial paper is rare and of little importance to our results). For revolvers, we count the amount drawn down, as the accounting data does when calculating firm liabilities (the actual debt is only the amount used). We also divide firms into investment grade and high yield, corresponding to a median rating of BBB+ and above (IG) or BB- and below (HY). We code ratings according to a scale from AAA=28 down to D=1, where each notch is one step.

When we lack a corporate credit rating (as we do for most firms), we estimate a linear regression model using cash over assets, interest payments over debt, return on assets, log of market cap (in USD), book to market ratio, stock price volatility, log of book assets, share trading volume, year fixed effects, country fixed effects and industry fixed effects to infer the rating a firm would have had if it were rated. For the approximately nine thousand observations where we have ratings data, the R-squared of this regression is 0.74 (0.67 without fixed effects). We truncate inferred ratings at 1 and 28 (the limits of the actual scale), to avoid some small firms having outlying values. Using the un-truncated value of estimated ratings does not change our classification of firms into IG and HY, nor our regression results.

There are 123,838 firm-year observations with data on debt structure and our base line control variables.

We identify first-time bond issuers as firms with no bonds outstanding at any previous time in the sample. To increase accuracy, we exclude the first three years of the sample for tests using first-time bond issuers. There are 100,213 firm-year
observations for this sample. Summary statistics for various firm level variables are reproduced in Table 1, Panel A. On average, bonds constitute 19.7% of total debt. For investment grade firms (where we use estimated ratings in order to be able to classify all firms), bonds constitute 32.5% of debt, and for high yield firms, 16.7%. The overall average is closer to the high yield data point because most firms are high yield. This fact is also evident from the fact that imputed ratings are much lower on average (12.9, i.e. B) than actual ratings (18.0, i.e. BBB–). Summary statistics for country level variables are presented in Table 1, Panel B.

To examine the consequences of bankruptcy efficiency we require a measure of the aggregate value for firms filing for bankruptcy. To avoid being tainted by selection problems, the measure should not be influenced by the firms that actually enter bankruptcy in a country.26 Djankov et al. (2008) devised just such a measure, based on surveys of lawyers regarding the outcome in a hypothetical bankruptcy case. Lawyers in each country were asked to assess the outcome for all involved parties when a specific firm (a hotel) defaults on an interest payment. Since the exact same case was considered in each country, the measure should be free of selection issues.27 The survey has subsequently been updated by the World Bank in the Doing Business survey, so that its data are available annually 2004-2013.28 We use 2004 data for 2000-2003, and otherwise use each year’s data. The main variable used to portray bankruptcy efficiency is the aggregate recovery of all creditors. The variable is measured in cents on the dollar, and ranges from 0 (Chad and Zimbabwe, in certain years) to 94.4 (Norway, 2004). Table 1, Panel B presents summary statistics across countries. As an alternative measure of the overall nature of the bankruptcy system in a country, we use the time in years between filing and exit, also from the Cost of Doing Business database and based on Djankov et al. In recent years, bankruptcy reform has been widespread and, in many countries, profound. To illustrate this

26 Otherwise, a country might appear to have low efficiency simply because very poor quality firms chose to file there.

27 See Djankov et al. (2008) for more detail on the hypothetical case.

28 Accessed at http://www.doingbusiness.org.
point, Table 2 describes four recent reform episodes. These episodes were all associated with significant changes in the measures of bankruptcy efficiency we use, although in different directions (Peru saw a drop in efficiency). Several of the episodes cover several years of new legislation and implementation, and this is often visible in the bankruptcy outcome measure. 29 Two alternative measures of bankruptcy efficiency are also collected from Djankov et al.: the time taken until insolvency has been resolved (“Bankruptcy delay”) and an indicator for whether or not the bankruptcy procedure results in a liquidation that by assumption is not efficient (“Inefficient liquidation”).

We collect data on creditor rights, an index aggregating creditor rights, first produced by La Porta et al. (1998), and updated in Djankov et al. The index ranges from 0 to 4, where 4 represents stronger rights. We also collect average annual exchange rates from CapitalIQ and translate all accounting data to USD at year-end market rates.

5. Empirical results

In this section, we examine the predictions of our model and other theories of debt structure. First, we document broad empirical patterns in bond usage. Second, we track individual firms around first issuance, and compare this to various types of models of debt types. Third, we test our model’s predictions about bankruptcy and bond market development in a multi-country panel. In this panel, to address endogeneity concerns (the bankruptcy system may be better in countries that for other reasons have larger bond markets), we also run tests that focus on bankruptcy reforms. This enables us to identify the effect of bankruptcy on bonds through a within-country methodology.

29 Neither Brazil nor Peru is important to our results (there are no or very few observations in the relevant years). We include them because these episodes demonstrate some of the features of bankruptcy reform.
5.1 Corporate debt structures

We start by documenting some facts about firm level debt dynamics and compare them to our model. Our model predicts that firms will tend to maintain the use of bank debt even if they have access to the bond market. As discussed above, many theories of bank and bond debt predict the opposite: once a firm has access to the bond market, it will reduce or eliminate its bank debt (e.g. bonds are cheaper but have some fixed issuance cost). In Table 3, we examine some parameters of the joint distribution of bonds and bank loans. We are especially interested in whether, in general, firms with outstanding bonds use bank loans. We divide firm-year observations into deciles based on the amount of bonds outstanding (effectively, deciles one through five all have zero bond debt). For each group, we calculate the number of firms that have outstanding bank loans and the amount of their bank loans relative to assets. The table shows that most firms with bond debt have bank loans, even among the firms with the highest amount of bonds outstanding relative to assets. It is also clear that the bank loan share is slowly decreasing in bond debt: for example, from firms with no bonds, to the 8th decile, where firms on average have bonds worth 8.5% of assets outstanding, the average amount of bank loans outstanding falls from 20.7% to 17.3% of assets. This is not driven by persistent use of revolving credit facilities across firms: the share of term loans falls from 14.3% of assets to 13.3% of assets. Overall, the evidence in Table 3 indicates that it is common for firms that use the bond market to simultaneously borrow from banks, including term loans. In other words, models that predict exclusive use of a single type of debt do not fit the data very well.

First-time bond issuers provide a particularly clear setting in which to examine the extent to which bonds replace bank debt for an individual firm that has access to the bond market for the first time. In our sample, there are 6,711 such first-time bond issuers between 2003 and 2011 (we lose the first few years of our sample because we require three years of previous data to make sure a firm has not issued bonds previously or at least recently).
In Figure 4, we track the debt structure and interest costs of firms around the first issuance of a bond from year -6 to year 6, counting the year of issuance as zero. All debt categories are normalized by the firm’s total book assets. Three striking patterns emerge. First, at first bond issue, firms increase leverage substantially. Second, after the initial spike at first bond issue, there is a gradual contraction both of bonds and of total leverage. Third, there is no reduction in bank debt around first bond issues, and no subsequent reduction in bank debt over time.\(^\text{30}\)

We next consider prices. Our model predicts that the cost of debt should be no lower for a firm that issues bonds. Fixed costs models of bond market participation predict a drop in interest costs at first issuance (otherwise incurring the fixed cost would not be motivated). Although measuring the cost of debt is complicated by maturity and risk considerations, following the same firm through time should reduce the concerns (as long as the maturity and risk is similar around a first bond issue). Figure 4b shows the 25\(^{\text{th}}\) percentile, median, average and 75\(^{\text{th}}\) percentile of interest costs. The figure suggests a modest uptick in the cost of debt when firms first issue a bond, following a slight decrease in the preceding years. Both of these small changes are statistically significant. The increase in interest cost appears inconsistent with predictions that bond markets should provide low interest rates (but high fixed costs, which mostly do not appear under interest in the income statement). An important caveat is that the large increase in leverage that we observe when a firm issues bonds for the first time may be a cause of costlier debt service due to increased credit risk. In regressions, we have added a rich set of firm controls and three powers of both book and market leverage, finding a slight increase in interest cost at first issue.

\(^{30}\) We also estimate regressions with firm fixed effects, to deal with changing sample composition over time in Figure 4b. The year-by-year coefficient estimates (not reported) are very similar to Figure 4b. Further, unreported, robustness tests include testing for a decline in bank debt around first bond issue for US firms exclusively, or for non-US firms exclusively. Results are similar across samples.
Taken together, the results in Figures 4a and 4b show limited substitution out of bank debt for firms that enter the bond market for the first time. A large bond issuance is followed by a gradual decline in leverage and bond debt outstanding while bank debt is stable or slowly increasing. The evidence for first-time bond issuers does not support “all bonds or all loans” type theories. It is more consistent with theories that predict the co-existence of both debt types in corporate capital structures.31

5.2 Bankruptcy and bond market development: cross-country evidence

We now test how the efficiency of in-court insolvency procedures (bankruptcy) affects bond markets. Before turning to firm-level data, we consider some broad, aggregate patterns in the corporate use of bonds. We sort firms into five broad categories of credit quality: AAA through A, BBB, BB, B, and CCC through C (these groups are of comparable size). To simplify and illuminate broad cross-country differences, we sort countries into three groups: Asia, North America, and Europe. Of these, North America, quantitatively dominated by the US, has a very efficient bankruptcy system, Europe has an intermediate efficiency, and Asia has the poorest bankruptcy recovery (we will exploit the important within-region variation in bankruptcy recovery in regression analysis below). Regional averages for the recovery measure (the average efficiency) are 79.8 (North America), 55.6 (Europe) and 35.4 (Asia). Does this correspond to differential use of bonds? The average share of bonds (in total debt) is compared across continents – separately for each category of credit risk -- in Figure 5. The difference between North American and European bond shares, and their ratio, are reported at the bottom of the figure. The use of bonds is declining in credit quality. However, this is much less pronounced for North American firms, while European and Asian firms almost cease the use of bonds in

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31 The co-existence of bonds and loans is also consistent with issuers wanting to combine different maturities, or funding different investments differently (e.g., fixed capital investment vs. working capital). However, these theories do not explain our main results about bankruptcy efficiency (see below).
the low categories. The ratio of average bond share for US firms relative to European firms rises from 1.25 for high quality firms to 3.97 for the lowest quality firms. This implies that some quantitatively important determinant of the size of bond markets is related to credit quality, i.e. default risk. In particular, this pattern is consistent with our theory, which suggests that better bankruptcy (i.e. the US) should be associated with more bonds, and that the effect should be stronger for lower credit quality firms. If this pattern were absent at this very high level of aggregation, our theory would not matter for broad patterns even if it had some predictive power at the margin. That said, the test is not necessarily well identified (since we have not controlled for firm or country level factors that may relate to the use of bonds). To address this, we turn to regressions of individual firm-year level observations, exploiting the full variation of the bankruptcy recovery measure (i.e. both differences between countries in the same region and between years within a country).

Regression results examining the link between bankruptcy and debt structure for the 2003-2011 period are presented in Table 4. The basic regression specification is:

\[ Bond \ share_{it} = \beta_{Bcy} Bcy_{c(i)t} + \beta'X_{it} + F_t + I_{i(j)} + \epsilon_{it} \] (5)

In equation (5), \( t \) represents years, \( i \) represents firms, \( c(i) \) the country to which a firm belongs, and \( j(i) \) the industry to which firm \( i \) belongs. The dependent variable \( Bond \ share_{it} \) is the share of bonds in a firm’s debt. \( Bcy \) is the bankruptcy recovery variable. \( X \) represents a vector of firm level control variables, \( F \) is a set of time fixed effects and \( I \) a set of industry fixed effects.

Bankruptcy recovery is predicted to have a positive association with the use of bond debt. In Table 4, column (1), we document an unconditional correlation between bankruptcy recovery and the use of bond by public firms, adjusting standard errors through clustering by country. This corresponds to dropping \( X, I \) and
F from equation (5). The coefficient on bankruptcy is positive and significant, consistent with the prediction that efficient bankruptcy is beneficial to bond market development. We next control for a range of firm-level variables including size, profitability, credit risk and stock market valuation ratios, as well as for institutional features of national credit markets, such as creditor rights (this specification corresponds to equation 5). This regression is reported in column (2). Many of the control variables predict bond debt as might be expected from previous studies: larger firms with good credit ratings and high stock market turnover have more bonds in their debt mix. The coefficient on bankruptcy recovery is positive and significant at the 5% level and slightly larger than in the regression without controls. The economic magnitude is large: a one standard deviation increase in bankruptcy recovery (22.6) corresponds to increased bond issuance by 5.6% of assets, approximately a quarter of the average level. If this coefficient reflects causality running from the performance of the bankruptcy system to bond market size (i.e. assuming it does not reflect reverse causality or omitted variables), the finding supports our main theoretical prediction.

A second prediction of the theory is that bankruptcy recovery should matter more for higher risk firms. In column (3), we interact bankruptcy recovery with credit rating. The regression equation is:

\[
Bond \ share_{it} = \beta_{Bcy} Bcy_{c(i)t} + \beta_{BcyXRating} [Bcy_{c(i)t} \times R_{it}] + \beta' X_{it} + F_t + I_{j(i)} + \epsilon_{it} \quad (6)
\]

The interaction coefficient implies that bankruptcy recovery is less important for safe firms (a high value of credit rating corresponds to safe ratings). The total coefficient for bankruptcy recovery in this regression is 0.005 for an A rated issuer, 0.08 for a BBB-rated issuer and 0.23 for a B rated firm. In other words, the effect of bankruptcy recovery is much larger for high yield firms, and essentially absent for the safest IG firms. In column (4), we allow the coefficient to vary non-linearly with credit rating, by dividing firm-years into three groups. We find again that weak firms
are most affected by bankruptcy recovery, while the highest rated firms show no significant effect. In these regressions, we use the implied credit rating for unrated firms (the construction of the inferred rating is described above in the data section). Next, we use actual ratings from Moody’s and S&P instead, to make sure the result is not an artifact of how we construct inferred ratings. The sample size is much smaller, but we find again that bankruptcy recovery is much more important for the debt composition of weaker firms. In column (6) we use a simple indicator for whether a firm is profitable or not (strictly positive net income) to test for how risk matters without relying on credit ratings. The effect of ratings is about one third lower for profitable firms than for unprofitable firms.

The US has the world’s most developed corporate bond market, and also a sophisticated system for handling insolvent firms in court, and we interpret this as very consistent with our theory. However, the US is unusual on many dimensions, and if our predicted relationship could not be identified outside of the US, we would be less confident in the theory’s relevance. We therefore re-estimate our key regression in column (7) without US firms. Again, we find that bankruptcy recovery matters for the debt mix, and mostly for high-risk firms. Alternatively, a concern might be that we estimate the effect of bankruptcy reforms at very low levels of efficiency, but that reforms in more advanced countries are less impactful. To address this, we re-estimate our regressions for OECD countries only, reported in column (8). The bankruptcy recovery coefficient is significantly larger for OECD countries than for the whole sample. This suggests that, bankruptcy reform may be most useful in advanced economies.

Our theory predicts a stronger relationship between bankruptcy rules and debt mix for higher risk firms. This is consistent with the coefficient on interactions variables in Table 4. We next implement a non-parametric estimation of this prediction, by sorting firms into deciles. Figure 6 shows the estimated effect of bankruptcy recovery on the bond share of debt for firms in each decile. As we move toward weaker firms (lower credit quality), the effect of bankruptcy on the debt mix
grows progressively stronger. The first decile where the effect is (individually) statistically significant at the 95% level is the fourth, corresponding to a rating of around BB-. The highest point estimate is for the weakest decile, and the largest t-statistic for the second to lowest decile. Both Table 4 and Figure 6 emphasize the key role of credit quality in mediating how bankruptcy recovery is associated with bond use. Put differently: strong firms issued bonds everywhere, but weak firms only issue bonds when they are located in a country with a good bankruptcy system.

The positive relation between bankruptcy and bond market development can be reproduced outside of our firm level data set. For this, we use a composite index of bond market efficiency, constructed by the World Bank (2006) based on data on size, breadth, liquidity, stability and other factors. A strong positive relation between bankruptcy recovery and bond markets is apparent in Figure 7.

5.3 Robustness tests

In this section, we present additional robustness tests. Many features of the institutional and legal context of bond markets may matter for the results we study and this generates a potential omitted variable concern. As a first robustness test, we therefore perform a horse race between bankruptcy and some standard measures of institutional quality that may be important to financial markets. We use creditor rights as a control throughout, but in these tests also add additional institutional controls, targeting a broader set of possible determinants of financial contracting. The results, reported in Table 5, are based on Equation (5) of Table 4, with the added institutional controls.

In column (1), we add Composite risk rating, from Political Risk Services, used by e.g. Erb, Harvey and Viskanta (1996) and Levchencko (2007). In columns (2) and (3) we add “Starting a business” and “Enforcing contracts,” respectively. These are the two variables from the World Bank’s Doing Business Indicators which are available
the furthest back (from 2004, like the insolvency variables we use). A third set of variables is even broader in scope, looking at society-wide institutions. From the Worldwide Governance Indicators, described by Kaufman, Kraay and Mastruzzi (2010), we select the two variables that seem most relevant for financial markets: “Regulatory Quality” and “Rule of Law”.32 The results for these two variables are reported in columns (4) and (5), respectively. Of the institutional variables, only composite risk rating and starting a business are significantly related to bond share. More importantly, the coefficient estimates for bankruptcy recovery remain similar in magnitude to the baseline and statistically different from zero in all specifications.

Second, we test whether our bankruptcy recovery variable captures some generic development affecting many financial variables at once. Bankruptcy reform may form part of a broader financial reform push, which may affect bond market development. If so, the specifications reported in Table 4 would suffer from an omitted variable problem, and the bond market changes we observe could not be interpreted as due to insolvency reform. To assess this, we consider whether bankruptcy recovery is related to corporate finance choices that are not directly related to bankruptcy. We use three variables: the dividend yield (dividends paid, as a fraction of market capitalization), the payout ratio (dividends paid as a fraction of net income), and net equity issues (percentage change in book equity). Results are presented in Table 6. For each dependent variable, we replicate the regressions in column (1) and (2) of Table 4, i.e. with no controls and with firm controls and year and country fixed effects, respectively. We do not detect any statistically significant effect of the bankruptcy variable for any of these financial policy variables. Thus, we conclude that it is less likely that the variable captures some broader financial reform process affecting many aspects of corporate finance.

In Table 7, we present a number of further robustness tests. We first replace bankruptcy recovery with two alternative measures of how well court-based

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32 We did not use Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Control of Corruption, but results are similar with these.
insolvency works: the time required between filing and exit from bankruptcy, and an indicator for liquidation. Both of these variables capture well-known concerns about bankruptcy procedures: that they are slow, and that they have a bias toward excessive liquidation (see e.g., Kahl 2002). Both variables produce results similar to the bankruptcy-recovery variable: for riskier firms, better bankruptcy (low delays, no liquidation) has a significant positive association with the use of bonds.

We next turn to an alternative dependent variable. Many of the sample firms have a stable debt mix, and many never issue bonds. Such firms might be passively focusing on bank loans, and may never consider bonds at all. The capital structure decision we are most interested in for testing our theory may therefore be the first issuance of bonds. In columns (5) and (6) of Table 7, we examine the sample of firms that have not previously had bonds on their balance sheet (within our sample period). We regress an indicator for first bond issue on control variables, using a linear probability model (results are very similar with logit and probit models). For the full sample, there is no effect on the average probability of first bond issuance. When we allow for an interaction between bankruptcy recovery and firm ratings, the result suggests a differential effect by credit quality. Based on column 6, the probability of first bond issue is associated with bankruptcy recovery for high yield firms.

5.4 Evidence from bankruptcy reforms

Because there is more cross-country than time-series variation in bankruptcy systems, results estimated in the large firm panel data set used in table 4 are essentially cross-sectional. We now turn to within-country changes in bankruptcy reform. The advantage is that the identifying assumption is weaker: to use cross-country variation, we must assume that omitted variables (unmeasured drivers of the share of bonds in corporate capital structures) are unrelated to bankruptcy recovery. To use within-country changes, we need to assume that changes in bankruptcy recovery are uncorrelated with changes in omitted variables. To the
extent that bankruptcy reform tends to be lengthy and technical, it would seem a fairly innocuous assumption that changes are not related to other events that drive the bank-bond use (such as the business cycle).

The World Bank’s Doing Business Survey covers our entire sample except the first three years, and contains many changes in bankruptcy recovery (in both directions). These changes in the measured recovery typically follow revisions of the bankruptcy code, such as those outlined in Table 2 (sometimes the organization of bankruptcy changes without a legal change, for example when court operations are revised).\[33\]

In Table 8, we introduce country fixed effects into the baseline regression. For the first two columns, the regression equation is:

$$\text{Bond share}_{it} = \beta_{Bcy} Bcy(t) + \beta'X_{it} + F_t + I_j(i) + H_c(i) + \epsilon_{it} \quad (7)$$

For columns three to six, the regression equation is:

$$\text{Bond share}_{it} = \beta_{Bcy} Bcy(t) + \beta_{Bcy} X \cdot Rating[Bcy(t) \times R_{it}] + \beta'X_{it} + F_t + I_j(i) + H_c(i) + \epsilon_{it} \quad (8)$$

Here $H$ represents country fixed effects. Compared to the tests in Table 4, following (5) and (6), the country fixed effects absorb any time-invariant variation across countries. This has the effect of throwing out cross-sectional variation in bankruptcy recovery. The creditor rights variable also drops out. The R-squared increases by 0.085 in the main specification with the additional fixed effects. We now cluster by country-year since the variable of interest varies at that level. The coefficient on bankruptcy is identified off within-country time-series variation. We

\[33\] The ten largest changes (in absolute terms) with more than 50 observations are, in order of the size of the change: Italy 2005 (+28.3), Denmark 2008 (+16.5), Chile 2007 (+10.6), Sweden 2007 (-8.7), Turkey 2007 (7.2), Norway 2005 (-6.8), Chile 2011 (+6.5), Italy 2009 (-5.2) and Spain 2009 (-5.2). Among countries with more than 1,000 observations the biggest change is for the US in 2007 (-3.2).
include the same set of firm level controls as before, but do not report coefficients for space reasons. In column (1) we reprise the main test with the additional fixed effects. The coefficient on bankruptcy recovery is comparable in magnitude to the cross-sectional estimate and significant at the 10% level. We next focus on years when there is a change in bankruptcy recovery. We exclude observations in country-years where there is no change in efficiency, reported in column (2). The coefficient estimate of interest is still significant at the 10% level and comparable to the cross-sectional estimate. A ten-percentage point increase in recovery is predicted to increase the average bond share by approximately 3% of debt, or about a sixth of the mean share. In columns (3) and (4) we add the interaction between recovery and rating in order to consider how changes in bankruptcy recovery affect the relative use of bonds by safer and riskier firms. We allow country-specific interactions with our ratings measure (in order to throw out cross-country identification). The results are consistent with what we found using cross-sectional data: weaker firms’ reliance on bonds increases much more when bankruptcy recoveries go up.

In the last two columns, we include macroeconomic controls, to address the possibility that the timing of bankruptcy reform may be related to the business cycle or other broad economic trends. We use GDP per capita (at PPP, in logs), the growth rate of GDP, and the country’s population, on their own and interacted with ratings. We find that bankruptcy recovery and its interaction with ratings remain significant with these additional controls. The macro-economic variables show limited and slightly contradictory associations with bond use, perhaps reflecting cyclicality similar to that documented by Becker and Ivashina (2014).\textsuperscript{34}

The results using time series variation in recovery confirm a statistical link between the quality of bankruptcy and corporate reliance on the bond market.

\textsuperscript{34} In additional unreported robustness tests, we have excluded countries with large reversals in their changes (Hungary, Norway and Sweden), collapsed data by country year, and weighted observations by country size. The results are similar. We have also included the institutional variables (cf. Table 5). Because all five institutional variables exhibit very limited times series variation (within countries), these tests are perhaps less likely to be important. As expected, including the institutions has limited impact on the coefficient on recovery.
Because these results are likely to be less affected by omitted variable bias than panel regressions in Table 4, they bolster the interpretation that the statistical connection reflects causality running from bankruptcy systems to bond markets.

6. Conclusions

We present a model of two forms of debt, bank debt and loans, which differ in terms of funding costs, and bargaining power in insolvency. From this model we derive the key predictions that the use of bond debt is favored by efficient in-court bankruptcies, especially for high-risk borrowers. Our theory does well in matching aggregate country-level patterns, using levels and changes in the efficiency of insolvency resolution in court.

Our conclusions about the link between bankruptcy and bond markets have important policy implications. Using a back-of-the envelope calculation, bringing all countries up to US bankruptcy recovery is estimated to increase the size of the global corporate bond market by almost $1 trillion, or around a quarter of the current size. Much of this increase would happen in high yield bonds. In fact, such a shift would close more than half the gap in debt mix between the US and other countries. In this sense, insolvency resolution appears to be one of the main drivers behind “missing” corporate bond markets in many countries. Increasing the share of bonds in corporate debt could offer several potential benefits: (a) reduce exposure of firm funding to cycles in the bank loan supply (see e.g. Chava and Purnandam 2009; and Jiménez, Ongena, Peydro, and Saurina 2012; Becker and Ivashina 2014); (b) allow better risk sharing, since bonds can be held more widely than bank loans; and (c) remove large concentrated credit risks from the banking system, making regulation and oversight of the banking system easier. Thus, apart from any direct benefits of better bankruptcy decisions, potentially large additional benefits stem from the impact this may have on credit market structure.
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Appendix

Proof of Propositions 1 and 2: The proof of Propositions 1 and 2 follows from
the argument in the text above and the following three lemmas, noting that the
assumption \( cB \leq (n - 1)(1 - q) \) is equivalent to \( q\sigma nB/(cB + 1 - q) \leq q\sigma(n - 1)/c \).

Lemma 1: If and only if \( D > q\sigma(n - 1)/c \), there exists a symmetric equilibrium
such that the fraction of bank financing is \( \sqrt{\frac{q\sigma(n-1)}{Dc}} < 1 \) and the interest rate is equal
to \( \frac{q}{1-q} \).

Proof: We will prove the statement by first calculating the first-stage actions
by the banks for the equilibrium candidate and thereafter showing that there are no
profitable deviations.

Maximizing \( U(L_i, L_{-i}) \) with respect to \( L_i \) under the assumption that \( L < D \)
gives the first-order condition:

\[
\frac{qD\sigma L_{-i}}{L^2} - cL_i = 0.
\]

Plugging in \( L_j = L/n \) for all \( j \) gives:

\[
L^* = \sqrt{\frac{q\sigma(n-1)D}{c}}.
\]

This expression is smaller than \( D \) if and only if \( D > q\sigma(n - 1)/c \).

The expected bank profits for this profile are given by \( q(D\sigma \frac{n+1}{2n^2} - f) \), which is
positive by the assumption in footnote 19.

The function \( U(L_i, L_{-i}) \) is concave in \( L_i \) for \( L \leq D \). Likewise, \( U(L_i, L_{-i}) \) is
concave in \( L_i \) for \( L \geq D \). From the first property follows that there are no profitable
deviations from \( L_i^* = L^*/n \) in the set \([0, D - (n - 1) L_i^*] \). However, we also need to
show that there are no profitable deviations for larger values of \( L_i \). We will do this by
demonstrating that the right partial of \( U(D - (n - 1) L_i^*, (n - 1) L_i^*) \) with respect to \( L_i \)
is negative under the condition such that \( nL_i^* < D \), and thereafter invoke concavity of
\( U(L_i, L_{-i}) \) for \( L \geq D \).
Calculating the right partial gives:

\[ U'_{L_i+}(D - (n - 1)L_i^* - (n - 1)L_i^*) = -(D - (n - 1)L_i^*) \left( \frac{1 - q}{B} + c \right) + q\sigma \]

\[ \leq - \frac{c}{n - 1} \left( n(D - (n - 1)L_i^*) - \frac{q\sigma(n - 1)}{c} \right), \]

\[ = - \frac{c}{n - 1} \left( n(D - (n - 1)L_i^*) - \frac{nL_i^*}{D}nL_i^* \right), \]

where the inequality follows from the assumption that \( cB \leq (n - 1)(1 - q) \). Since \( nL_i^* < D \), the last expression must be negative. □

**Lemma 2:** If and only if \( D < q\sigma nB / (cB + 1 - q) \), there exists a symmetric equilibrium such that there is only bank financing, total bank loans are equal to \( L^{**} = n((1 - q)D + Bq\sigma) / (cB + (1 - q)(n + 1)) \), and the interest rate is \( R(L^{**}) \).

**Proof:** We proceed as in the proof of Lemma 1, by first deriving the equilibrium candidate and thereafter showing that there are no profitable deviations.

Maximizing \( U(L_i, L_{-i}) \) with respect to \( L_i \) under the assumption that \( L > D \) gives the first-order condition:

\[ (1 - q)(R'(L)L_i + R(L)) + q(-1 + \sigma) - cL_i = 0. \]

Plugging in \( L_j = L/n \) for all \( j \) gives:

\[ L^{**} = \frac{n((1 - q)D + Bq\sigma)}{cB + (1 - q)(n + 1)}. \]

This expression is greater than \( D \) if and only if \( D < \sigma nqB / (cB + 1 - q) \).

Moreover, expected bank profits for this profile are given by \( \left( \frac{1-q}{B} + \sigma \right) \frac{L^{**2}}{n^2} - qf \), which is positive by footnote 19.

The function \( U(L_i, L_{-i}) \) is concave in \( L_i \) for \( L \leq D \). Likewise, \( U(L_i, L_{-i}) \) is concave in \( L_i \) for \( L \geq D \). From the second property follows that there are no profitable deviations from \( L_i^{**} = L^{**} / n \) in the set \( [\max\{D - (n - 1)L_i^{**}, 0\}, \infty) \). However, we need to show that there are no profitable deviations outside this set. We will do this by demonstrating that the left partial of \( U(D - (n - 1)L_i^{**}, (n - 1)L_i^{**}) \) with respect to \( L_i \)
is positive under the conditions such that \( nL_i^* > D \), and thereafter invoke concavity of \( U(L_i, L_{-i}) \) for \( L \leq D \).

If \( D \leq (n-1)L_i^* \), it follows trivially that there are no profitable deviation from \( L_i^* \). We will therefore consider the case where \( D > (n-1)L_i^* \).

Calculating the left partial gives:

\[
U'_L(D - (n-1)L_i^*, (n-1)L_i^*) = \frac{q\sigma(n-1)L_i^*}{D} - c(D - (n-1)L_i^*)
\]

\[
= \frac{q\sigma(n-1)cL_i^*}{D} - c(D - (n-1)L_i^*)
\]

\[
\geq c(nL_i^* - D),
\]

where the last inequality follows from:

\[
q\sigma(n-1)/c \geq q\sigma nB/(cB + 1 - q) > D.
\]

Hence, marginal profits are positive.

Since \( U(L_i, L_{-i}) \) is concave in \( L_i \) for \( L \leq D \) and for \( L \geq D \), it follows that there are no profitable deviations from \( L_i^* \) and \( L_i^{**} \). □

**Lemma 3**: If and only if \( q\sigma(n-1)/c \geq D \geq q\sigma nB/(cB + 1 - q) \), there exists a symmetric equilibrium such that there is only bank financing, total bank loans equal \( D \), and the interest rate is equal to bond-investors break-even rate, \( \frac{q}{1-q} \).

**Proof**: We will show that \( L_j^{**} = D/n \) for all \( j \) is an equilibrium if and only if \( q\sigma(n-1)/c \geq D \geq q\sigma nB/(cB + 1 - q) \). We will do this by demonstrating that for this action profile, the marginal profits from increasing or decreasing \( L_i \) are nonpositive if and only if the condition holds.

Calculating the right partial gives:

\[
U'_L(D/n, (n-1)D/n) = -\frac{D}{n} \left( \frac{1-q}{B} + c \right) + q\sigma,
\]

which is nonpositive if and only if \( D \geq q\sigma nB/(cB + 1 - q) \).

Calculating the left partial gives:

\[
U'_L\left( \frac{D}{n}, \frac{(n-1)D}{n} \right) = \frac{q\sigma(n-1)}{n} - cD/n,
\]
which is nonnegative if and only if \( \frac{q\sigma(n-1)}{c} \geq D \). Since \( U(L_i, L_{-i}) \) is concave in \( L_i \) for \( L \leq D \) and for \( L \geq D \), it follows that there are no profitable deviations from \( L_i^{**} \).

It is easy to see that expected bank profits are larger in this equilibrium than in the equilibrium of Lemma 2 and hence positive. ■

**Proof of Propositions 3 and 4:** Using the result in Lemma 1 and taking the partials and cross partials of \( L^*/D = \sqrt{q\sigma(n-1)/Dc} \), where \( D = as - bsq/(1 - q) \), immediately gives the results. ■
Figure 1. Debt outstanding, listed non-financial corporations, by region, 2010

The figure presents aggregate outstanding debt for publicly traded in thirty-seven countries for the fiscal year 2010, aggregated by region. Amounts are translated to dollars at year-end market exchange rates. All numbers are in trillions of dollars. North America is Canada, Mexico, and the United States; Europe is Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, Switzerland, and the United Kingdom; Asia is India, Indonesia, Japan, South Korea, Malaysia, Philippines, Taiwan, and Turkey.
Figure 2. Interest rate, bond issuance, and bank loans as a function of firm size

The figure presents how key variables in the model relate to firm size.
Figure 3. Absolute priority violations for senior debt in and out of court

This figure shows absolute priority violations in bankruptcy and restructurings. The graph reports the frequency with which bonds and loans receive recovery 10% or more below the recovery they would have received in case absolute priority had been respected. The sample is all securities involved in US defaults between 1995 and 2011 included in Moody’s Default and Recovery Database (DRD). The sample is restricted to senior debt. Actual recovery is compared to hypothetical recovery following the absolute priority rule. The figure reports how frequently deviations larger than 10% of principal occur. 95% confidence intervals for the means are reported in bars.
Figure 4. Debt structure and interest cost around first issuance of bonds

The figure presents the components of debt as a fraction of total assets, and interest costs, around the year of a first bond issue. There are 6,711 events in the sample, corresponding to firms issuing a bond, note or commercial paper in one of the years between 2003 and 2011, but which reports no such debt outstanding in previous sample years (the full sample covers 2000-2011). Interest costs (required to be less than 50%) is available for 2,397 observations. Countries with the most than events are: USA, Canada, Japan, India, Australia, United Kingdom, Malaysia, France, Germany, Poland, South Africa, Greece, Sweden, Hong Kong, Norway and Switzerland.

Figure 4a. Capital structure

Figure 4b. Interest cost

- Interquartile range
- Median interest cost
- Average interest cost
Figure 5. Debt structure by region and credit risk category

The figure presents the share of bonds in total debt for public firms, by region (Asia, Europe and North America) and by credit risk category. Credit risk categories are based on estimated ratings using a linear regression estimate (most of the sample firms are not rated). The figure is based on 2010 data. 95% confidence intervals, assuming cross-sectional independence, are reported with bars around each column. * represents significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.
Figure 6. Efficiency of bankruptcy: effect on corporate bond stock

This figure shows the estimated effect of bankruptcy recovery rates by credit quality. Observations are sorted into deciles of credit ratings (14.3 thousand firm-years each). The effect of bankruptcy recovery is estimated separately for each decile (the regression otherwise corresponds to those reported in Table 4). This table reports the coefficient estimate for each decile, multiplied with one cross-country standard deviation of recovery rates (22.3). 95% confidence intervals are indicated with bars for each decile.

Predicted effect on bond share of total debt for a standard deviation increase in bankruptcy recovery

Median credit rating of each decile of credit quality (better to worse)
Figure 7. Bond market development and bankruptcy: using World Bank data

This figure shows the relationship between bankruptcy recovery and composite bond market development, as reported by the World Bank (2006), and captures various aspects of bond market development, including liquidity and size, averaged for the 2001-2005 period. Three-letter codes denote countries. The correlation is 0.61 and the R-squared is 0.37.
Table 1. Selected summary statistics: firm level data

Summary statistics are reported in Panel A for variables that vary by firm and year. Rating is the corporate credit rating. For S&P, the scale is AAA=28, AA+=26, AA=25, AA-=24, A+=23 and so on down to CCC-=9. CC=7, C=4 and D=1 (in default). When there are two ratings, the average was used. Estimated credit ratings are based on a regression. Explanatory variables in the ratings estimation are described in the text. Investment grade is equal to one if the estimate rating is 18 or higher. In Panel B, cross-country summaries of variables from the World Bank’s cost of doing business survey, covering 169 countries, are reported. Each country-year is one observation for the purpose of calculating summary statistics here. Only 44 countries are represented in our firm sample, and we also report summary statistics across this subsample.

Panel (A) Firm variables

| Variable Description | Mean  | Std. dev. | Min  | 25th perc. | Median | 75th perc. | Max |
|----------------------|-------|-----------|------|------------|--------|------------|-----|
| Bond share in debt   | 0.197 | 0.324     | 0    | 0          | 0      | 0.291      | 1   |
| Bond share in debt, IG firms | 0.325 | 0.360 | 0 | 0 | 0.175 | 0.649 | 1 |
| Bond share in debt, HY firms | 0.167 | 0.307 | 0 | 0 | 0 | 0.178 | 1 |
| Bond share in debt, ex-US | 0.136 | 0.263 | 0 | 0 | 0 | 0.137 | 1 |
| Rating, actual       | 18.0  | 3.7       | 1    | 15         | 18     | 21         | 28  |
| Rating, estimated    | 12.9  | 4.6       | 1    | 10.0       | 13.4   | 16.1       | 28  |
| Investment grade     | 0.167 | 0.373     | 0    | 0          | 0      | 0          | 1   |

Panel (B) Country variables

| Variable Description | Mean  | Std. dev. | Min  | 25th perc. | Median | 75th perc. | Max |
|----------------------|-------|-----------|------|------------|--------|------------|-----|
| Bankruptcy recovery  | 36.1  | 22.6      | 0.0  | 20.8       | 31.6   | 44.4       | 92.5|
| Bankruptcy recovery, sample countries | 56.5 | 26.7   | 4.4 | 34.1 | 64.2 | 80.2 | 92.5 |
| Bankruptcy time (years), 2010 | 2.90 | 1.41 | 0.4 | 1.9 | 2.8 | 4 | 8 |
| Bankruptcy time (years), sample countries | 2.12 | 1.43 | 0.4 | 1.1 | 1.8 | 3 | 6.5 |
Table 2. Bankruptcy reform examples

This table presents brief summaries of five selected reform examples. Each of these corresponds to a change in bankruptcy recovery.

| Country | Reform summary |
|---------|----------------|
| Brazil  | A new bankruptcy law aiming to allow viable firms to reorganize and survive was passed in 2004. Key features were a stronger role for creditors, limitations to the size of labor claims in bankruptcy, and reduced priority for tax claims. Going concern sales free and clear of tax and labor liens and liabilities were introduced by the new law. The average time of bankruptcy proceedings subsequently fell by half. See Ponticelli (2013). |
| Italy   | Prompted by the Parmalat scandal and a couple of other large firm failures, a number of reforms were implemented to Italian bankruptcy and insolvency rules between 2004 and 2007. Notably, creditors were allowed to reach a deal with creditors outside of bankruptcy; the minimum requirements for a reorganization (instead of a liquidation) were reduced; the creditors’ committee gained more influence in proceedings; it removed limits to operations while in bankruptcy. The Italian reforms dramatically reduced backlogs and reduced the frequency of liquidation. Rodano, Serrano-Velarde, and Tarantino (2014) point out that the reforms were somewhat contradictory. See also Beye and Nasr (2008). |
| Poland  | Poland recently undertook a number of procedural and operational reforms to facilitate the resolution of insolvency. Features include: changed documentation requirements for bankruptcy filings; increased qualifications for administrators; limiting pay for administrators. Improved electronic systems to processes cases and assign them to judges as well as to improve the operations of courts were introduced over the 2004-2007 period, reducing case backlogs. The civil procedure was amended in 2012, eliminating separate procedural steps in commercial cases. Poland has also reformed insolvency law, notably introducing a reorganization procedure. Secured creditors have also received stronger rights. See Doing Business (2013). |
| Peru    | Peru undertook a range of reforms to improve credit availability to the private sector during the early 2000s. For example, security interests were vastly simplified and out-of-court resolution facilitated. The implementation of the reforms was problematic. Also, amending and adjusting a reorganization plan became more difficult. These issues resulted in a reduction of bankruptcy recovery around 2007. See Marechal and Shahi-Sales (2008). |
| Germany | A substantive reform of German insolvency law came into effect in March 2012 (too late to be in our sample). The goal was to facilitate restructuring. Creditors became more involved through the introduction of a “preliminary creditors’ committee”. The reform increased the ability to retain pre-filing management teams in charge, rather than a court-appointed administrator (as long as the creditor committee agrees). Protections against creditor claims (similar to a stay on assets) have been improved. Debt-for-equity swaps became possible without shareholder consent (and can also be crammed down). |
Table 3. Coexistence of bank loans and bond debt

The table reports the frequency of firm-years having non-zero bank loans, and the amount of bonds, bank loans and term loans, relative to assets. Firms have been grouped by decile of bond debt as a share of assets. The sample is limited to firms with at least one type of debt.

| Decile of bond use (increasing) | Bonds (% assets) | Bank loans (% assets) | Term loans (% assets) | Share of firms with bank loans |
|---------------------------------|------------------|-----------------------|-----------------------|-------------------------------|
| Decile 1-5                      | 0.0%             | 20.7%                 | 14.3%                 | 100.0%                        |
| 6                               | 0.5%             | 17.0%                 | 13.5%                 | 79.5%                         |
| 7                               | 3.1%             | 18.7%                 | 14.9%                 | 83.0%                         |
| 8                               | 8.5%             | 17.3%                 | 13.3%                 | 83.7%                         |
| 9                               | 17.2%            | 12.8%                 | 9.4%                  | 79.6%                         |
| 10                              | 42.3%            | 9.2%                  | 6.2%                  | 65.7%                         |
Table 4. Bankruptcy recovery and corporate debt mix

The table shows regressions of bond use. The dependent variable is bonds as a share of debt. Variable definitions are described in the data section. Creditor rights is a legal variable, credit rating (AAA = 28; AA+=26, AA=25, … CCC=9, CC=7, and C=4) includes inferred ratings; ROA is operating income over assets; dividend indicator is positive for dividend payers; market capitalization and book assets are measured in US $ and logged; Book-to-market; volatility is annualized, based on daily returns. Volume refers to turnover of shares on stock exchange. Dependent variables are lagged. Heteroskedasticity–robust standard errors, clustered by country, are reported below coefficients. * represents significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

| Dependent var. | Bond share | Sample | All | All | All | All | All | Ex-US | OECD |
|----------------|------------|--------|-----|-----|-----|-----|-----|-------|------|
| Bankruptcy recovery | 0.224** | 0.247** | 0.580*** | 1.561*** | 0.358*** | 0.502*** | 0.995*** |
| Recovery x Credit rating | 0.010 | 0.009 | 0.126 | 0.319 | 0.085 | 0.139 | 0.205 |
| ... x High rating | 0.025*** | 0.171 | 0.119 | 0.096 | 0.075 | -0.058*** | 0.019 |
| ... x Medium rat. | 0.205** | 0.096 | 0.123 | 0.028*** | 0.060 | 0.026 | 0.037 |
| ... x Low rating | 0.346*** | 0.096 | 0.728*** | 0.078 | -0.103 | 0.103 | 0.115 |
| ... x S&P rating | 0.052* | 0.046 | 0.041 | 0.230*** | 0.052 | -0.004 | 0.060 |
| ... x Profitable | 0.163*** | 0.150*** | 0.161*** | 0.344 | 0.149*** | 0.123*** | 0.140*** |
| Creditor rights | -0.055** | -0.055** | -0.052** | -0.047*** | -0.056** | -0.022 | -0.065*** |
| Credit Rating, inferred | -0.035** | -0.016 | -0.039** | -0.134*** | -0.038** | 0.012 | -0.012 |
| ROA | 0.022 | 0.042 | 0.050 | 0.728** | 0.078 | -0.103 | 0.103 |
| Dividend indicator | 0.052* | 0.046 | 0.041 | 0.230*** | 0.052 | -0.004 | 0.060 |
| Cash/Assets | 0.015 | 0.016 | 0.016 | 0.038 | 0.016 | 0.013 | 0.020 |
| Market capitaliz. | 0.048*** | 0.053*** | 0.046*** | 0.127*** | 0.054*** | 0.030** | 0.063*** |
| Book-to-market | -0.001 | -0.001 | -0.014 | 0.007 | -0.002 | -0.011 | 0.003 |
| Volatility | 0.003* | 0.003 | 0.002 | -0.002*** | 0.003 | 0.001* | 0.000 |
| Book assets | 0.035*** | 0.034*** | 0.035*** | 0.056** | 0.035*** | 0.020*** | 0.042*** |
| Volume | 0.188*** | 0.196*** | 0.189*** | 0.852*** | 0.202*** | 0.081 | 0.247*** |
| Dep. var. mean | 0.212 | 0.212 | 0.212 | 0.212 | 0.597 | 0.212 | 0.147 | 0.229 |

Robust standard errors, clustered by country, are reported below coefficients. * represents significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.
| Industry, year F.E. | No  | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| N                  | 185,808 | 123,805 | 123,805 | 123,805 | 8,252 | 123,805 | 95,174 | 98,257 |
| R-squared          | 0.018 | 0.193 | 0.180 | 0.197 | 0.225 | 0.173 | 0.110 | 0.193 |
| Clusters           | 62 | 40 | 40 | 40 | 34 | 37 | 39 | 25 |
### Table 5. Alternative institutional control variables

The table shows regressions of bond use, based on Table 4. Firm level controls are: Credit Rating, ROA, Dividend indicator, Cash/Assets, Market capitalization, Book-to-market, volatility, Book assets, Volume. Institutional variables are described in the text. Heteroskedasticity–robust standard errors, clustered by country, are reported below coefficients. * represents significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

| Firm sample | (1)  | (2)  | (3)  | (4)  | (5)  |
|-------------|------|------|------|------|------|
| All         | All  | All  | All  | All  | All  |
| Dependent variable | Bond share | Bond share | Bond share | Bond share | Bond share |
| Dep. var. mean | 0.221 | 0.215 | 0.215 | 0.216 | 0.216 |
| Bankruptcy recovery | 0.349*** | 0.239** | 0.215** | 0.205** | 0.239** |
| Composite risk rating | -0.011** | 0.005 | 0.005 | 0.005 | 0.005 |
| Starting a business | -0.004*** | 0.001 | 0.001 | 0.001 | 0.001 |
| Contract enforcement | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| Regulatory Quality | 0.029 | 0.033 | 0.033 | 0.033 | 0.033 |
| Rule of Law | 0.006 | 0.028 | 0.028 | 0.028 | 0.028 |
| Creditor rights | -0.051*** | -0.056** | -0.056** | -0.055** | -0.055** |
| Firm level controls | Yes | Yes | Yes | Yes | Yes |
| Industry, year F.E. | Yes | Yes | Yes | Yes | Yes |
| N | 92,192 | 100,735 | 100,735 | 119,295 | 119,295 |
| R-squared | 0.206 | 0.187 | 0.187 | 0.196 | 0.196 |
| Clusters | 33 | 40 | 40 | 40 | 40 |
## Table 6. Alternative financial outcomes

The table shows regressions of alternative financial outcomes, based on Table 4. Net equity issues is change in book equity divided by previous book equity (times one hundred). Payout ratio is the ratio of dividends paid to net income, defined only for observations with positive net income. Dividend yield is net dividends paid over end of year market capitalization (times one hundred). Controls are: Creditor rights, Credit Rating, inferred, ROA, Dividend indicator, Cash/Assets, Market capitalization, Book-to-market, Volatility, Book assets, Volume. Variable definitions are described in the data section. Heteroskedasticity–robust standard errors, clustered by country, are reported below coefficients. * represents significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

| Dependent variable | Dividend yield (%) | Payout ratio (%) | Net equity issues (%) |
|--------------------|--------------------|-----------------|----------------------|
| Sample             | All                | All             | All                  |
| Dep. var. mean     | 1.705              | 1.952           | 23.733               |
|                    | 28.521             | 8.844           | 7.992                |
| Bankruptcy recovery| -0.010             | -0.014          | -0.199               |
|                    | -0.179             | -0.048          | 0.037                |
| Creditor rights    | 0.119              | 0.170           | 0.551                |
|                    | 0.200              | 1.826           | 0.610                |
| Credit Rating, inferred | 0.552***          | 11.327***       | -0.265               |
| ROA                | -2.320             | -95.871***      | 90.433***            |
|                    | 1.777              | 11.576          | 16.118               |
| Dividend indicator |                    |                 |                      |
| Cash/Assets        | -0.205             | -20.399***      | 7.151                |
|                    | 0.371              | 2.946           | 4.398                |
| Market capitaliz.  | -0.923***          | -8.881***       | 3.417***             |
|                    | 0.174              | 1.598           | 0.678                |
| Book-to-market     | -0.227             | -7.296***       | 6.167*               |
|                    | 0.151              | 1.856           | 2.428                |
| Volatility         | 0.005*             | 0.071**         | -0.023               |
|                    | 0.002              | 0.026           | 0.016                |
| Book assets        | 0.005              | -4.192***       | -3.203***            |
|                    | 0.002              | 0.756           | 1.524                |
| Volume             | -2.430***          | -42.718***      | 3.910*               |
|                    | 0.647              | 5.579           | 2.001                |
| Industry, year F.E.| No                 | Yes             | No                   |
|                    | 192,488            | 116,442         | 196,377              |
|                    | 107,243            | 187,403         | 116,720              |
| N                  | 0.002              | 0.121           | 0.004                |
|                    | 0.122              | 0.000           | 0.110                |
| Clusters           | 62                 | 34              | 62                   |
|                    | 38                 | 62              | 40                   |
**Table 7. Alternative measures of bankruptcy recovery and bond use**

The table shows regressions of bond use. In columns (1) to (4), the dependent variable is the bond share of debt, in (5) and (6) an indicator for first bond issue. Bankruptcy delay is time to resolution in years. Inefficient liquidation is an indicator of the worst bankruptcy outcome from Djankov et al. (2008). See variable descriptions in Table 4. Heteroskedasticity–robust standard errors, clustered by country, are reported below coefficients. * represents significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

| Dependent variable | (1) Bond share | (2) First bond issue | (3) | (4) | (5) | (6) |
|--------------------|----------------|----------------------|-----|-----|-----|-----|
| Sample             | All            | All                  | All | All | All | All |
| Dep. var. mean     | 0.216          | 0.216                | 0.212| 0.212| 0.035| 0.035|
| Bankruptcy recovery|                | -0.016               | 0.087**| 0.010| 0.037| 0.005**|
| Recovery x Credit rating | 0.024** | -0.087*** | 0.012| 0.024| 0.005***| 0.002|
| Bankruptcy delays  |                | -0.065**             | -0.164***| 0.032| 0.037| 0.008***|
| Delays x Credit rating | 0.005*** | 0.002               | 0.133***| 0.117***| 0.151***| 0.149***| 0.276| 0.192|
| Inefficient liquidation | -0.057** | -0.060** | -0.049**| -0.049**| 0.142| 0.167|
| Credit Rating      |                | -0.030*              | -0.039**| -0.023| -0.024| -0.168| 0.311|
| ROA                |                | -0.074               | -0.052| 0.085| 0.085| -4.649***| -4.818***|
| Dividend indicator |                | 0.034                | 0.029| 0.032| 0.028| 0.187| 0.029|
| Cash/Assets        |                | 0.039                | 0.038| 0.031| 0.032| 0.342| 0.305|
| Market capitaliz.  |                | 0.133***             | 0.117***| 0.151***| 0.149***| 0.276| 0.192|
| Book-to-market     |                | 0.049***             | 0.054***| 0.038**| 0.037**| -0.143| -0.193|
| Book assets        |                | -0.011               | -0.008| -0.015| -0.015| -0.536| -0.545|
| Volume             |                | 0.001***             | 0.001***| 0.001*| 0.001*| 0.009***| 0.009***|
| Industry, year F.E.|                | 0.000                | 0.000| 0.000| 0.000| 0.002| 0.002|
| N                  |                | 93,122               | 93,122| 123,838| 123,838| 100,213| 100,213|
| R-squared          |                | 0.187                | 0.189| 0.182| 0.182| 0.022| 0.022|
| Clusters           |                | 38                   | 38| 40| 40| 39| 39|
**Table 8. Bankruptcy recovery and corporate debt mix: changes in bankruptcy recovery**

The table shows regressions of bond use with country fixed effects, to identify the effect of changes in bankruptcy recovery. Country-years with large changes in recovery (above 3% in absolute terms) and more than 10 observations are: Sweden 2005, Italy 2005, Norway 2005, Denmark 2006, Norway 2006, Chile 2007, Denmark 2007, Hungary 2007, Turkey 2007, United States 2007, Denmark 2008, Italy 2009, Netherlands 2009, Portugal 2009, Spain 2009, Australia 2011, Chile 2011, Portugal 2011, United Kingdom 2011, United States 2011. The dependent variable is the bond share of debt. GDP per capita is measured at purchasing power parity. GDP per capita and population are in logs. See other variable descriptions in Table 4. Heteroskedasticity–robust standard errors, clustered by country-year, are reported below coefficients. * represents significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

| Dependent var. | Sample | All | Years with change in recovery | All | Years with change in recovery | All | Years with change in recovery |
|----------------|--------|-----|-------------------------------|-----|-------------------------------|-----|-------------------------------|
| Dep. var. mean | 0.216  | 0.204 | 0.216 | 0.204 | 0.216 | 0.204 |
| Bankruptcy recovery | 0.306* | 0.363* | 0.381** | 0.436** | 0.539** | 0.569*** |
| Recovery x Credit rating | -0.057** | -0.056** | -0.017*** | -0.017*** |
| GDP per capita | -0.302* | -0.255 |
| GDP growth | 0.069* | 0.010** |
| Population | 0.402 | 0.131 |
| Rating x GDP per capita | 0.005** | 0.007*** |
| Rating x GDP growth | -0.037** | -0.033** |
| Rating x Population | -0.047 | -0.068 |

Firm controls: Credit Rating, ROA, Dividend Indicator, Cash/Assets, Market capitalization, Book-to-market, Volatility, Book assets, Volume

| Country, industry, year F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Country F.E. x Rating | No | No | Yes | Yes | Yes | Yes |
| N | 93,050 | 76,075 | 93,050 | 76,075 | 93,029 | 76,068 |
| R-squared | 0.265 | 0.266 | 0.265 | 0.264 | 0.266 | 0.267 |
| Clusters | 269 | 221 | 269 | 221 | 263 | 220 |