Insolvency resolution and the missing high yield bond markets

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Abstract. In many countries bankruptcy is associated with low recovery by creditors. We present a model of corporate credit with a bond market and risk averse banks. Inefficient bankruptcy forces restructuring of insolvent firms to happen out of court, which favors banks over bondholders. The model predicts that riskier borrowers will rely on banks in countries with inefficient bankruptcy but also bonds when bankruptcy is efficient. First, the model matches empirical size – debt mix patterns. Second, as predicted, across countries, efficient bankruptcy is associated with more bond issuance by high risk borrowers (this effect is smaller or absent for firms that are unlikely to face insolvency). Our empirical estimates suggest that a one standard deviation increase in recovery rates (26%) increases the overall share of bonds by 5% of firm assets, corresponding to two thirds of the difference between the US and other countries.

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Most external financing to corporations is debt, i.e. financing with a fixed and predetermined repayment schedule. Among the many details in which debt contracts vary, one stands out: the difference between intermediated debt (such as bank loans) and non-intermediated debt (bonds and commercial paper). Corporations use both in very large amounts, and often use both simultaneously.[1] There are strong cross-country differences in the mix of debt use: for European listed companies the amount of loans outstanding is more than twice the amount of bonds. US firms, on the contrary, have *more* bonds outstanding. Figure 1 shows aggregate amounts of bond debt, bank loans, and other debt for corporations in North America, Europe, and Asia in 2010. It is clear that there are very large geographical differences in the mix of debt issued by corporations.

This international variation in the corporate debt mix, not previously documented in detail, cannot easily be explained by standard models of bank-bond choice, which focus on the superior monitoring ability of banks (Diamond 1991) or the fixed costs associated with bond issuance (e.g. Bhagat and Frost 1986). 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, firms need monitoring both in France and Canada, and banks presumably interact with their large borrowers in approximately the same way, generating similar information.

We propose instead that cross-country variation in how insolvency is treated offers a better explanation the broad cross-country patterns. Countries do exhibit substantial differences in how creditors in insolvent firms are treated: recovery rates range from negligible to above 90% (Djankov, Hart, McLiesh and Shleifer 2008). The differences in recoveries can be traced to poor liquidation decisions by courts, delays, and direct costs of the process.

We develop a model where firms can chose between two forms of debt to fund an investment: bank loans and bonds. Concentrated banks have a bargaining advantage over dispersed bond holders. When a firm can repay its debts, there are no negotiations, and bargaining power is inconsequential. The risk sharing advantage of bonds generally favors using bonds when a firm is large. However, when a firm is in distress, the quality of the system for resolving distress determines what happens. If the formal bankruptcy system delivers good values (e.g. picks efficient liquidation outcomes), distress is resolved in court. Weak claimants such as bondholder get fair treatment in court, and therefore are not at a disadvantage. When the bankruptcy system is poor, on the other hand, insolvency has to be resolved out of court. In this setting, bargaining power favors banks over bond holders, and banks can extract some

[1] In the United States, non-financial non-farm corporate business had \$3.0 trillion of loans and \$5.6 trillion of bonds and commercial paper outstanding at the end of the third quarter of 2012 (Flow of Funds 2012Q3).

value from bondholders (by forcing them to make concessions). Ex ante, bond holders require higher promised payments (a high interest rate) to compensate. In such an economy, a high risk firm (insolvency is likely) will tend to use bank loans to finance its investment. A low risk firm can issue bonds in any economy, since insolvency resolution is not likely to matter.

This model is successful in matching data in a large international panel of firms. Our model predicts that many firms will find it optimal to maintain bank debt while accessing the bond market. This is in contrast with all types of fixed costs theories of bonds. We confirm that larger firms and riskier firms tend to use bonds, and that firms with very small outstanding debt tend to rely on bank loans. This holds both in the cross-section and in predictions of who issues bonds for the first time. Our model also does well in areas where it disagrees with other theories of banks and bonds: large firms with bond balances overwhelmingly maintain some bank debt on their balance sheets. Our findings do not reject the possible informational advantages of banks.[2] They imply, however, that for large firms, these theories struggle to fit the data. If bank debt is costly, why would large firms with access to the bond market (and that have paid the fixed participation costs) ever get bank loans (outside of distress and duress)? Yet the empirical pattern is that they do.

Most importantly, our model makes two key cross-country predictions: (1) large low-risk firms are able to use bonds regardless of the quality of the bankruptcy system; (2) large high-risk firms will issue bonds if the bankruptcy system works well (because they offer superior risk sharing) but loans if the bankruptcy system works poorly (because firms find it expensive to compensate bondholders for the expropriation by banks they suffer in distress). We document that cross-sectional differences in bankruptcy recovery rates explain debt usage, and especially for high risk firms. We also use bankruptcy reforms in several countries to reduce reverse causality and omitted variable concerns. We find that reforms that are associated with improvements in bankruptcy recovery rates increase bond usage.

Using a back-of-the envelope calculation, we estimate that bringing all countries up to US recovery rates (which are not the highest) would increase corporate bond markets by almost $1 trillion, or around a quarter of the current size (in our sample). For high risk borrowers especially, this hypothetical represents a massive shift in their debt mix. Increasing the share of

[2]According to Rajan (1992), firms with higher profits are more worried about expropriation by banks, and so have a stronger preference for bond markets. According to Diamond (1991), better known firms are more likely to issue bonds. In our panel data, we find evidence consistent with both these theories, but neither explains the coexistence of the two firms of debt. On the other hand, Boot and Thakor (1997) discuss a possible extension of their model where they envision that firms optimally *"balance the benefits of bank monitoring and financial market information aggregation"* so that firms with high moral hazard problems chose more bank debt and those with less asymmetric information use market debt.

bonds could offer several potential benefits: (a) reduce exposure of firm funding to the relatively large cycles in the bank loan supply (see e.g. Chava Purnandam 2009, Becker Ivashina 2011, and Jimenez Ongena Peydro Saurina 2012); (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.

1. Bonds, bank loans and corporate credit

While the financing supplied is similar, there are large institutional differences in how it's delivered. Bank loans are typically made by insured and regulated deposit-taking institutions[3], which may screen and monitor borrowers, whereas bonds are held by mostly passive institutional investors.[4] These institutional differences correspond to differences in the flow to credit. The supply of bank debt is pro-cyclical and sensitive to banks' financial conditions (Kashyap, Stein and Wilcox 1993, Becker and Ivashina 2011), whereas bond issuance is sensitive to fund flows (Chernenko and Sunderam 2012). This has important implications for the role of credit in the business cycle (Holmström and Tirole 1997).

The coexistence of two such institutionally different credit supply channels (banks and fixed income markets), providing similar financing to firms, has been considered puzzling. Fama (1985) suggests that banks face costs that markets do not[5], and that their existence and importance is a sign of some countervailing advantage that banks must have. Academic research has largely proceeded on the assumption that the main challenge in understanding credit is to identify the advantages banks have over credit markets, which permit them to exist (in the face of their higher costs). A simple such bank advantage is that firms raising debt from banks economize on the reporting, regulatory and underwriting costs associated with issuing public debt (Bhagat and Frost 1986, Smith 1986, Blackwell and Kidwell 1988, and Carey et al 1993). If such fixed costs are important, small firms will borrow from banks and large firms issue bonds, simply based on cost minimization.[6]

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[3] Not all intermediated credit is supplied by deposit-taking banks, although these represent the majority of corporate lending. See Denis and Mihov (2003) about the role of non-bank debt.

[4] The distinction between bank loans and bonds is not as clear as it used to be (Thomas and Wang 2004). For example, loans are often syndicated. The growth of the syndicated loan market has increased the amount of diversification of lenders (Benmelech, Dlugosz and Ivashina 2010). We discuss what our model predicts about syndicated loans below.

[5] These costs include low returns on required reserves (Black 1975), other costs of regulatory limits to risk taking and operations, the costs of operating a branch network (Besanko and Kanatas 1993, Holmström and Tirole 1997) and agency costs between banks and depositors (Diamond 1984).

[6] The fixed costs of bond market participation include underwriting fees, fees to credit rating agencies, as well as trust and legal fees.

Another possible advantage of banks over bond markets is their ability to produce information about borrowers. This information production allows them to perform both ex-ante screening and ex-post monitoring of corporate borrowers.[7] Theories of information advantages predict that firms which require monitoring will rely on bank loans, whereas those that are sufficiently well known, because they are large (Fama 1985) or because they have a good track record of repaying debt (Diamond 1991), can turn to bond markets.

The group of theories that start from banks' costs disadvantage - both those based on scale and those based on information - predict a strong link between firm size and the form of debt: small firms will rely exclusively on bank debt, whereas large firms will use the bond market. This matches a well known stylized fact: small firms rely exclusively on banks and larger firms are more likely to issue bonds (Hale and Santos 2002, and Petersen and Rajan 1994). Also, older firms are more likely to use bonds (Johnson 1997, and Rajan 1992). However, these theories struggle to explain the co-existence of bank loans and bonds in firm capital structures. In our sample, covering 37 countries for a ten-year period, this is widespread: 84% of firms with bonds outstanding also have bank debt on their balance sheet.[8] As pointed out in the introduction, this finding does not reject an informational advantage of banks in some situations, but suggest other forces must also be relevant.

2. Theory

In this section, we model a firm's choice of debt structure in a static model with multiple risk-averse banks and a corporate bond market. Initially, a profit-maximizing firm has a downward-sloping linear demand function for capital, $\mu D(r)$, where $\mu > 0$ is a scale parameter. Subsequently, the debt becomes due. With probability q it is solvent (it can repay the debt with interest in full) and with probability $1-q$ it is insolvent. An insolvent firm has to be restructured, either through a formal bankruptcy or an out-of-court restructuring. This process is described in more detail below.

The firm can obtain financing by borrowing from banks and/or by issuing corporate bonds to dispersed risk-neutral investors. There are $n > 1$ identical banks in the market. Each

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[7] Information-based theories of banks include Diamond (1984, 1991), Besanko and Kanatas 1993 and Boot and Thakor (1997) (banks monitor or screen borrowers), Petersen and Rajan (1994) (lenders gather information about their borrowers over time); Repullo and Suarez (1998) (banks provide a sharper threat of liquidation) and Bolton Freixas 2000 (banks have a superior ability to renegotiate). See James (1987), Houston and James (1997) and Hadlock and James (2002) for evidence consistent with the existence of informational advantages for banks.

[8] This is consistent with Johnson (1997), who reports that "41% of firms with access to public debt markets have some long-term bank debt" in a smaller and older sample of US firms. Becker and Ivashina (2011) report that new bank loans are frequent in their sample, consisting of a group of firms with recent bond issues.

bank is assumed to behave as if it were maximizing expected utility given an increasing and concave twice continuously differentiable utility function $u(.)$ and initial wealth $w > 0$. The assumption of a convex loan supply from individual banks reflects the idea that making large loans exposes banks to idiosyncratic risks which they do not like. This convexity can reflect owners' preferences, managerial risk aversion, or be due to regulatory capital requirements.[9] To guarantee the existence of an increasing loan supply function, we also assume that the associated relative risk aversion is non-increasing and no greater than one for positive wealth levels. Banks have a net funding cost of $\gamma \geq 0$ per unit of capital.

The bond market consists of a measure M of atomistic risk-neutral bond investors. Each bond investor is willing to supply one unit of capital at any interest rate r that gives him an expected return greater than or equal to the risk-free rate $\delta \geq \gamma$. Hence, we allow banks to have access to cheaper financing than bond investors. This may, for instance, be due to the presence of deposit insurance and other guarantees of bank debt by government institutions.[10] Denoting the interest rate at which bond investors earn zero expected return by k, the aggregate supply of bond investors, $B(r)$, is M for interest rates $r > k$, $B \in [0, M]$ for $r = k$, and zero for $r < k$. For simplicity, we will assume $M > \mu D(\delta)$, implying that there is sufficient bond market supply to satisfy the entirety of the firm's funding needs.

We assume that the firm's managers (or owners) chose the debt mix in order to minimize the interest rate r, i.e. the repayment they must make in case the firm remains solvent and makes good on its liabilities. In contrast, how much is paid to various claimants in a restructuring scenario (where owners get nothing) does not enter into their decision making. We will also assume that $D(k) > 0$ and that bank financing is preferred if interest rates are equal. This gives an inverse residual demand function, $r(L)$, for aggregate bank loans, L, which is k for $L \leq \mu D(k)$ and $D^{-1}(\frac{L}{\mu})$ for $L > \mu D(k)$.

We now describe the restructuring game that takes place if the firm cannot repay its debts. The firm can either be liquidated or continue operating. Exactly one of these solutions is optimal in the sense of off offering higher total payoffs, but which depends on the individual firm. Denote total claims (excluding interest) by I. If the optimal action (say liquidation) is undertaken, the value of total claims is $(1 + \beta)I$, and if the suboptimal action (in this case continuing operation) is undertaken, the value of claims is $(1 + \alpha)I$, where $\alpha < \beta < \gamma$.

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[9] Ivashina (2009) provides empirical evidence for the importance of bank risk aversion in syndicated lending.

[10] Deposit insurance is now very widespread (Demirgüç-Kunt and Kane 2002). Merton (1977) and O'Hara and Shaw (1990) discuss the value of bank guarantees in theory and in data.

Resolution in case of insolvency can either happen through formal bankruptcy, executed by a bankruptcy court, or through an out-of-court restructuring. We assume that in such a resolution, all creditors (lending banks and bond holders) first learn whether the bankruptcy court will make an optimal liquidation decision or not. Ex ante, the court's decision is optimal with probability p and suboptimal with probability $1-p$. We model bankruptcies this way to capture the propensity for inefficient liquidation decisions documented by Djankov et al (2008) across a wide range of countries.

Out-of-court restructuring requires unanimity, and any creditor can force bankruptcy. In the absence of unanimity, the firm is put into a formal bankruptcy. In a bankruptcy, the bankruptcy court decides between liquidation and continuing operations. The priority of claims is maintained in a bankruptcy, so that if an optimal solution is implemented, each bank i with a loan of L_i obtains $(1+\beta)L_i$ and the set of bond holders $(1+\beta)(I-L)$. We abstract from security and collateral and other contractual determination of priority in bankruptcy.[11]

In an out-of-court restructuring, the optimal liquidation decision is always implemented. The value to be distributed among creditors is $(1+\beta)I$ minus an arbitrarily small transaction cost, proportional to I. The creditors simultaneously decide whether to take an active part in the reorganization, at an arbitrarily small fixed cost $f>0$, or remain passive. This cost may represent costs of expert advice, time and effort required to participate actively, or more abstractly, coordination costs. Passive creditors will be offered their outside option, i.e. what they would have earned in a bankruptcy. We assume that active creditors share the remaining surplus in a pro rata fashion. If no creditor takes an active part, bankruptcy takes place.

We do not explicitly model the bargaining between creditors, but argue that the stylized game described above can capture outcome of such a bargaining. The time line of the game is as follows:

1. Banks simultaneously announce to a third party how much they are willing to lend to the firm.
2. If the firm is insolvent, its creditors learn whether the bankruptcy court will make an optimal (probability p) or suboptimal (probability $1-p$) decision.
3. The creditors simultaneously choose whether to file for bankruptcy or perform an out-of-court restructuring. If there is a veto against the restructuring, a bankruptcy with pro rata allocation takes place and the game ends.

[11] In practice, bank debt is often senior to bonds. Allowing this would complicate the model. As long as the advantage of banks is larger outside of court than in court, the direction of results will maintain. Granting bonds seniority over banks in bankruptcy would change the model's predictions. Though uncommon in practice, we discuss this possibility in more detail below.

4. If there is no veto against the out-of-court restructuring, the creditors decide whether to take an active part in the restructuring, at a small fixed cost f, or not. Passive creditors receive their outside option, i.e. the bankruptcy payoff, and active creditors share the surplus in a pro rata fashion.

A key assumption of this model is that bargaining power is unimportant in bankruptcy. We have in mind the fact that bankruptcy offers a highly structured environment whose formal rules aim to quickly reorganize a firm's debts, and to protect the firm's integrity. By comparison, an out of court restructuring is much less organized. Gilson (1997) points to several factors that make it easier to reach a viable solution in court, including rules that reduce creditors' ability to block reorganization plans, and mandatory disclosure which reduces information asymmetries. Such features of the bankruptcy law are widespread. For example, Djankov et al (2008) report that 82% of countries have some kind of automatic stay on a bankrupt firm's assets. For these reason, we abstract completely from bargaining dynamics in bankruptcy, and assume that different debts get treated similarly.

The other key assumption in this model is that banks have stronger bargaining power than bond investors. This advantage can reflect the fact that bank loans are held in more concentrated positions than bonds, providing stronger incentives to monitor.[12] Banks may also be better informed than other creditors. Loan agreements sometimes include reporting covenants and visitation rights (but bonds do not tend to have such covenants). Bank loans often have more stringent default definitions, 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, our assumption 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), we calculate the frequency with which recoveries deviate by more than 10% points from what would have obtained had absolute priority been respected. We do this for the US because data coverage is good (when a restructuring does not involve any rated securities or loans, Moody's is less likely to capture it). Figure 3 reports the frequency of deviations in bankruptcy and out of court, for senior bonds and senior bank loans. Whereas bank loans quite often experience APR violations in bankruptcy (27% of the time) they very rarely do out of court (7%). 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. However, and in contrast to bank loans, bonds are at least as likely to experience

[12] Ivashina (2009) demonstrates how bank loan syndicates are designed to ensure that the lead bank has incentives to be active.

APR violations out of court. APR violations are six times as common for bonds as for bank loans out of court. This evidence appears consistent with our assumption that out of court restructurings favor banks relative to bond holders.

2.A Results

We will look for a subgame-pefect equilibrium in pure strategies of the above game. For simplicity, we will assume transaction costs and fixed bargaining costs are close to zero. We proceed by solving the game backwards.

If f is sufficiently small and there are banks lending to the firm, then all of them strictly prefer to take an active part in the reorganization if the bankruptcy court would make a suboptimal decision. If the court instead would make an optimal decision, then no creditor would participate actively since there is no surplus to be shared.

If both banks and bond investors lend to the firm, then no bond investors will participate actively in the reorganization due to the fixed cost f. If only bond investors lend to the firm, then a fraction of them will participate actively in equilibrium.[13]

If the transaction cost is small enough, banks lending to the firm strictly prefer restructuring to bankruptcy in stage 3 when the bankruptcy court would implement the suboptimal solution. Likewise, lending banks strictly prefer bankruptcy when the bankruptcy court would make an optimal decision. Since bond holders are indifferent, there is subgame-perfect equilibrium where reorganization takes place when the bankruptcy court is inefficient and bankruptcy when it is efficient. We will henceforth focus on this equilibrium.[14]

This gives us three payoff-relevant events (gross payoffs reported in the table):

Event	**Probability**	**Bank payoff**	**Aggregate bond payoff**
Solvency	$1-q$	$(1+r(L))L_i$	$(1+r(L))(I-L)$
Bankruptcy	qp	$(1+\beta)L_i$	$(1+\beta)(I-L)$
Reorganization	$q(1-p)$	$(1+\alpha)L_i+(\beta-\alpha)\mu D(r(L))L_i/L$	$(1+\alpha)(I-L)$

Using this, and defining $L_{-i} \coloneqq \sum_{j\neq i} L_j$, we will now proceed to find the equilibrium actions in stage 1. First, we write each bank's expected payoff as:

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[13] The number of active bond holders in equilibrium, m, will be determined by the inequalities $\frac{(\beta-\alpha-\varepsilon)J}{f}-1<m\leq\frac{(\beta-\alpha-\varepsilon)J}{f}$, where ε denotes the transaction cost and J the measure of bond holders.

[14] The equilibrium described Pareto dominates any equilibrium where the firm goes bankrupt irrespective of the bankruptcy court's decision.

$$U(L_i, L_{-i}) = (1-q)u\big((r(L)-\gamma)L_i + w\big) + qpu\big((\beta-\gamma)L_i + w\big) + qpu\big((\alpha-\gamma)L_i + (\beta-\alpha)\mu D(r(L))L_i/L + w - f\big).$$

Second, we solve for the break-even rate, k, of bond investors:

$$k = \frac{\delta - (p\beta + (1-p)\alpha)q}{1-q}.$$

In equilibrium, each bank i lends an amount L_i^*, which is a solution to the following optimization problem:

$$\max_{L_i \geq 0} U(L_i, L_{-i}^*).$$

This is a concave problem and the function is differentiable everywhere except possibly at the kink where $L = \mu D(k)$. We will focus on symmetric equilibria, where $L^* = nL_i^*$ for all i. Such equilibria are characterized by the first-order condition $U_{L_i}(L_i^*, (n-1)L_i^*) = 0$.[15] There are two kinds of such equilibria: (a) those where only banks lend to the firm, $L^* = \mu D(r(L^*))$, and (b) those where both banks and bond investors lend to the firm, $L^* < \mu D(r(L^*))$.

Our first result states that there is a threshold firm size such that only banks lends to smaller firms smaller and both banks and bond investors lend to larger firms.

Proposition 1. There is a $\overline{\mu} > 0$ such that for $0 < \mu \leq \overline{\mu}$, only banks lend to the firm, and for $\mu > \overline{\mu}$ both banks and bond investors.

The intuition for this result is that banks have weakly smaller capital cost, earns a higher return than bond holders in out-of-court restructuring, and have a concave utility function. Thus, marginal utility from lending is positive for sufficiently small loan size, but negative for sufficiently large loan size.

We will henceforth focus on symmetric equilibria where $\mu > \overline{\mu}$, such that the firm is financed both via bank loans and the bond market. Our second result states that if banks earn negative returns in case of reorganization, then the elasticity of bank loans with respect to total debt is positive, but less than one. Hence, as demand for capital increases, bank loans increase in volume but their fraction of total debt is decreasing.

Proposition 2. If $L^*/\mu D(k) \geq (\beta - \alpha)/(\gamma - \alpha)$, then $0 < \frac{dL^*}{d(\mu D(k))}\frac{\mu D(k)}{L^*} < 1$.

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[15] We can rule out equilibria with zero bank loans since, for sufficiently small f, each bank would have incentives to deviate and offer a small loan at the interest rate k.

Bank loans are increasing in demand since higher total debt implies that each bank can extract more from the bond holders in case of out-of-court reorganization. The elasticity is smaller than one due to banks' concave utility function.

Our third results states that if banks earn negative returns in case of reorganization, the bond market provides at least as much capital as each bank, and demand is almost inelastic, then increasing bankruptcy efficiency, as measured by p, results in a lower fraction of bank loans.

Proposition 3. If $(n-1)/n \geq L^*/\mu D(k) \geq (\beta-\alpha)/(\gamma-\alpha)$ and $\mu D'(k) \approx 0$, then $\frac{d(L^*/\mu D(k)}{dp} < 0$.

Increasing bankruptcy efficiency has multiple effects. First, it increases the probability of efficient bankruptcy. Second, it reduces the probability of out-of-court restructuring. Third, it reduces the interest rate by reducing bond investors' break-even rate. The latter also has a positive impact on the firm's demand for capital, but since we assume demand is almost inelastic, this effect is negligible. The first effect has a positive impact on bank loans, but it is dominated by the negative impacts of the second and third effects under the assumption the fraction of bank loans is not too big.

Note that the conditions stated in Propositions 2 and 3 are sufficient. Numerical solutions of the case with CRRA utility reveal that they are not necessary for the results.

Our final results concern the interaction between the bankruptcy efficiency and the default probability. Due to difficulties in obtaining analytical results, we resort to numerical solutions of the case with CRRA utility. We obtain the following.

As bankruptcy efficiency (p) improves, the fraction of bond financing increases, but the effect is more pronounced the higher the default probability. One explanation for this result is that the equilibrium interest rate is more sensitive to changes in bankruptcy efficiency the higher the default probability. A second explanation is that the banks' payoff when the firm is insolvent carries greater weight when the default probability is high.

As can be observed in Figure 2a, firms with high probability of default have a lower fraction of bond financing than firms with a low probability of default when bankruptcy efficiency is low, but the reverse holds if bankruptcy efficiency is high. This can be explained by two countervailing forces: banks' risk aversion and their bargaining advantage in out-of-court restructuring. If bankruptcy efficiency is low, so that out-of-court restructuring carries relatively large weight, then banks facing borrowers with high default probability have more incentives to lend. If, on the other hand, bankruptcy efficiency is high, so that bankruptcy carries a larger weight, then banks' risk aversion makes them lend less to borrowers with higher default probability.

In Figure 2b, we illustrate the relationship between the fraction of bond financing and default probability for the case of low bankruptcy efficiency.

The key predictions of the model are that (a) the debt structure of firms that have access to the bond market may contain bank debt, (b) the use of bonds is increasing in the efficiency of formal bankruptcy proceedings, and (c), 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 (2011) 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.

3. 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) data base. The sample to 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 only used for Figure 3.

We collect firm data from CapitalIQ. The data covers 2000-2011, and firms from 44 countries.[16] 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 firms

[16] 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.

shares (annual, as a share of market capitalization) and corporate credit ratings from Moody's and S&P. There are 107,941 firm-year observations with data on debt structure and our base line control variables.

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 firms market value of 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.

The most important variables concern 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, and industry fixed effects to estimate the rating a firm would have. For the 8,408 observations where we have ratings data, the R-squared of this regression is 0.74 (0.67 without fixed effects). We truncate estimated ratings at 1 and 28 (the limits of the actual scale), to avoid some very 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.

In one set of tests, we examine first-time bond issuers, identified 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 these tests.

The main variable used to capture bankruptcy is the aggregate recovery of all creditors in a hypothetical bankruptcy case, from Djankov et al (2008). The value is based on a detailed survey of bankruptcy lawyers. The variable is measured in cents on the dollar, and ranges from 0 (Chad and Zimbabwe in certain years) to 94.4 (Norway, 2004). We collect updated values of this variable from the World Bank's "Cost of Doing Business".[17] The lowest value in an emerging economy is Brazil, as low as 0.2 in the mid-2000s. As an alternative measure of the efficiency 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.

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 (2007). 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.

4. 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 document the widespread use of multiple kinds of debt simultaneously. Third, we test our model (and other theories) in a multi-country panel. Finally, because of possible endogeneity concerns (the bankruptcy system may be better in countries that for other reasons have larger bond markets), we use bankruptcy reforms to identify the effect of bankruptcy through a difference-in-difference methodology.

4.A Corporate debt structures

We start by documenting some of the broad patterns in the corporate use of bonds and bank loans. Table 1 shows that bonds constitute 21.3% of debt on average. For investment grade firms (where we use estimated ratings in order to be able to classify all firms), bonds constitute 38.4% of debt, and for high yield firms, 17.8%. The overall average is closer to the high yield data point because most firms are high yield.

To investigate this difference in more detail, 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). In Figure 4, the equal weighted average bond share for firms within each category of credit risk is plotted, by continent. The table also reports the difference between North American and European averages, and their ratio. Clearly, the use of bonds is declining in credit quality. However, this is much less pronounced for North American firms, while European firms almost cease the use of bonds in the low categories. The ratio of average bond shares rises from 1.25 for high quality firms to 3.97 for the lowest quality firms. This suggests important drivers of bond market size are related to credit quality, i.e. default risk.

[17] Accessed at http://www.doingbusiness.org.

Having documented broad patterns of bond use, we will now turn to specific predictions of our model.

4.B Firm level evidence on the substitution between bank loans and bonds

We now aim to test a key firm-level prediction of our model: bonds provide a marginal source of debt financing, used only after bank loans are no longer as cheap. Specifically, we aim to test whether firms issuing bonds for the first time retain much their use of bank debt. What makes this an interesting prediction is that 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, because of fixed costs of some kind (i.e. bonds are cheaper but have some requirement or fixed issuance cost). We first examine the firm-level distribution of debt mixes. Table 2, Panel A contains the mean, median, standard deviation, and number of firm-year observations available for each of several capital-structure related variables. On average, bank debt constitutes 13% of assets (of this, 10% is term loans, and 3% revolvers), bonds constitute 5%, lease 1%, and other debt 3%. Total book leverage (the sum of these components) is 21% on average. For all types of debt except term loans (and hence bank loans overall), the median is zero, i.e. more than half of firms have none. For firms that have bank loans, bonds, or both outstanding, the ratio of bonds to bank loans and bonds is 0.27 on average, with median zero.

In panel B of Table 2, we examine more parameters of the joint distribution of bonds and bank loans. We are especially interested in whether, in general, bank loans and bonds are strong substitutes or appear together. We divide firm-year observations into two groups based on whether bank loans are at least 1% of assets ("high bank debt') or less ("low bank debt"). Within each group, we then calculate what fraction of observations has bonds outstanding worth at least 1% of assets. For low bank debt firms, 20% of firms have high bond debt, while for high bank debt firms, 38% have high bond debt. The difference, 18%, indicates that having bank debt makes it more likely that a firm has bonds also. In other words, the two forms of debt tend to appear together. In case this result is an artifact of the low threshold (1% of assets), we redo the analysis with 10% and 20% of assets as thresholds. Naturally, fewer firms qualify as high bank debt or high bond debt as we raise the threshold. The key pattern remains, however: having more bank debt raises the typical amount of bank loans a firm has.

First-time bond issuers provide a particularly clear setting in which to examine the extent to which bonds replace bank debt for an individual firms that has access to the bond market for the first time. In our sample, there are 2,635 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 5, we track the debt structure 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, a firm increase leverage substantially. Second, there is a gradual contraction of the use of bonds and of total debt over time. Third, there is no reduction in bank debt around first bond issues, and no subsequent reduction in bank debt over time. In other words, neither the level nor the growth rate of bank debt relative to assets seems to respond to bond issues.

Because of the limited time span of our sample, the non-parametric analysis in Figure 5 and 5 tracks a sample that changes through time. We have fewer firms in the early and late years, from 2,635 in year zero down to 395 observations for year 6 and 533 for year -6. This gradual change in the composition of firms might bias the patterns in Figure 5 and 5. We therefore estimate regressions with firm fixed effects. The year-by-year coefficient estimates (not reported) are very similar to Figure 5. This confirms that bank debt is typically not reduced when firms issue bonds is robust to controlling for the sample composition.[18]

We next consider prices. Our model predicts that there should be no reduction in the coat of debt when a firm issues bonds. Although measuring the cost of debt is complicated by maturity and risk consideration, following the same firm through time reduces the concerns somewhat (as long as the maturity and risk is similar through time). We thus examine the 25th percentile, median average and 75th percentile of the interest costs around first bond issuance. The results presented in Figure 6 suggest 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 changes are statistically significant. The increase in interest cost appears inconsistent with predictions that bond markets should provide low interest rates (but high fixed cost 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. Table 3 presents regression results that control time relative to bond issuance, and then add additional controls: first firm controls, then three powers of book and market leverage. The tests reject any expected negative effect of bond issuance on the interest cost. If anything, results with additional controls seem to suggest that the cost of debt increases when firms issue bonds – in line with the prediction of our model.

The results in Figures 4 and 5 show the complete absence of 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

[18] 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.

increasing. First, these results point to large fixed issuance costs in bond markets, and/or large minimum quantities, since first time bond issuance is associated with large leverage increases. Second, and more important, the pattern we document is consistent with models in which bonds are a marginal source of funding, used only after bank lending is exhausted or has become expensive. This is confirmed by the cost results in Figure 6, which suggest that accessing the bond market is expensive. This suggests that the amount of bank debt used in the economy is more likely to be determined by how much banks are willing to lend than by the graduation of firms into a category with bond market access. We examine cross-country patterns in the next section.

Could these patterns reflect maturity differences (Diamond 1993)? In other words, bank debt may be used by bond issuers as a temporary and variable source of finance, whereas bond debt is lumpy and adjusted rarely. This does not appear to be the major driver of the patterns in our data. First, we can exclude credit lines, and focus exclusively on term loans, which are longer maturity, and the pattern that bond issuers use more bank debt than non-issuers remains. Second, we can exploit the panel nature of our data to check the variability of the sources of financing. In fact, bond debt is no more stable than bank debt in firm capital structures.

4.C Evidence using panel data on bankruptcy

Next, we examine the relationship between measure of bankruptcy efficiency and debt structures of firms. The firm data is in the form of a panel, and we examine cross-sectional and time-series evidence in turn. In Table 4 Column (1) we regress the share of bonds in individual firms' debt structures on average recovery rates from the World Bank's Doing Business Survey, controlling for both firm level variables such as size, profitability, credit risk and stock market valuation ratios, and also features of national credit markets, such as creditor rights. The coefficient on bankruptcy efficiency is positive and significant at the 5% level, suggesting that better bankruptcy systems are associated with more use of bonds. In columns (2) and (3) we separate firms based on credit risk, and find that the effect of bankruptcy efficiency is driven by riskier firms. In column (4), we demonstrate the same effect using the full sample and an interaction variable that associates the impact of bankruptcy with low credit risk firms. Figure 7 documents the increasing effect of bankruptcy efficiency for deciles of credit quality.[19] As we move toward weaker firms (lower credit quality), the effect of bankruptcy on the debt mix grows progressively stronger.

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[19] Since most firms are not rated, we estimate ratings. The overall credit quality distribution is much worse than the distribution of credit quality among firms that have ratings, so the distribution in this graph is noticeably skewed toward weaker firms.

We next use an alternative measure of bankruptcy efficiency, the time required between filing and exit from bankruptcy. Columns (5) and (6) show, again, that higher credit risk firms use more debt when bankruptcy is better (in this, case, when the bankruptcy measure takes lower values). Finally, we exclude US firms, which constitute a large proportion of our sample. The results are similar.

By looking at the debt mix in capital structures, we can include many firms. On the other hand, many of these are fairly stable in their mix, and may in fact never issue bonds. To address this, we use a different methodology which focuses on first time bond issues, thus isolating an important (and rare) decision. In Table 5, we present regressions where the dependent variable is an indicator talking on the value 1 if a firm issues bonds in a given year. The sample contains all firms which have not previously had bonds on their balance sheet (within our sample). We replicate the set of controls for Table 4, use a linear probability model and find that riskier firms (but not safer firms) are more likely to issue bonds for the first time in countries with more efficient bankruptcy. The results hold without US firms (columns 3 and 4). These findings are consistent with the evidence in Table 4.

Taken together, the cross sectional evidence suggests that countries with better systems for organizing bankruptcy have larger corporate bond markets. Since we control both for creditor protection and for a multitude firm variables, we conclude that this likely does not reflect some overall leverage effect. However, bankruptcy efficiency may be correlated with other institutional features that vary from one country to the next. In the next section, we address this identification challenge.

4.D Evidence from bankruptcy reforms

A narrower form of identification comes from bankruptcy reforms, when a country may see changes in efficiency over time while many other institutions and rules remain the same. Assuming that such hypothetical alternative institutions do not change at the same time, and in the same direction, as bankruptcy efficiency, we can use reforms to identify the effect of bankruptcy. The Doing Business Survey covers a ten year period coinciding well with our firm data sample, and contains several changes in bankruptcy efficiency (in both directions). These generally follow revisions of the bankruptcy code.[20] The results for regressions of bond use after bankruptcy reforms suggest that improvements are followed by increased bond use, and changes associated with reduced recovery tend to be followed by lower bond use. This result holds both for the average bond share and its 90th percentile, as well as for the propensity of

[20] For example, Brazil saw a large improvement in 2007. See Ponticelli (2013).

non-bond users to issue for the first time. These results, although based on a smaller set of countries than the cross-sectional results, may be less affected by omitted variable bias or reverse causality, and therefore bolster the case that a good bankruptcy system helps the bond market.

5. Conclusions

We present a model of two forms of debt, bank debt and loans, which differ in terms of funding costs, risk sharing, 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.

We test the model's predictions using a comprehensive panel of publicly listed international firms. In accordance with the model, we find that firms that issue bonds for the first time maintain their bank debt. We also find that a modest uptick in the cost of debt when firms first issue a bond, following a slight decrease in the preceding years. This agrees with our model's predictions, but is inconsistent with models where bonds are cheaper than bank debt.

Our theory does well in matching aggregate country-level patterns. IV-regressions show that countries with large banks tend to have smaller bond markets and firms with a lower propensity to issue bonds.

How much larger would the bond market be if the efficiency of formal bankruptcy improved? We can use the estimates in table 4 to predict the effect on debt markets by bankruptcy reform. The cross-country standard deviation in recovery is 26.7. Based on the average coefficient estimate in Table 4, column (1), increasing recovery rates by one standard deviation everywhere would be predicted to raise the bond share of high risk issuers by 5 percentage points (or about a quarter of the average level of bond debt). This thought experiment may be too extreme, as some recovery rates are already close to 100 and cannot be expected to rise much. A more intricate thought experiment is to raise every country's recovery rate to 80, which is close to the 90th percentile (and also close to the US, but below e.g. Singapore, Norway and the UK). In our sample (which is tilted toward countries with good bankruptcy systems), the average firm would experience an increase in recovery of 8.0 percentage points. Using the 0.180 coefficient estimate of the impact of recovery rates on bond shares, this corresponds to a 1.4 percentage point increase in the bond share of debt, or approximately 7% of current debt levels. Based on total corporate debt (in our sample) of $10.2 trillion in 2010 (see Figure 1), this corresponds to about $700 billion of new bonds.

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Appendix

Proofs

Proof of Proposition 1. Define the function $g_r(\mu) = U^a_{L_i}\left(\frac{\mu D(r)}{n}, \frac{(n-1)\mu D(r)}{n}\right)$ where $U^a_{L_i}$ is the derivative of the expected utility function with only bank financing. This function is continuous and strictly decreasing in μ. Since $g_k(0) > 0$, and $g_k(\mu) < 0$ for sufficiently large μ, there must exist a unique $\hat{\mu}$>0 such that $g_k(\hat{\mu})$=0.

Likewise, define the function $g_r(\mu) = U^b_{L_i}\left(\frac{\mu D(r)}{n}, \frac{(n-1)\mu D(r)}{n}\right)$ where $U^b_{L_i}$ is the derivative of the expected utility function with both bank and bond financing. This function is continuous and strictly decreasing in μ. Since $h_k(0) > 0$, and $h_k(\mu) < 0$ for sufficiently large μ, there must exist a unique $\check{\mu}$>0 such that $h_k(\check{\mu})$=0.

There are potentially two cases to consider (a) $\hat{\mu} \leq \check{\mu}$, and (b) $\hat{\mu} > \check{\mu}$. In case (a), $L_i = \frac{\mu D(k)}{n}$ is an equilibrium for scale parameter μ if and only if $\hat{\mu} \leq \mu \leq \check{\mu}$. Moreover, equilibria have both bond and bank financing if and only if $\mu > \check{\mu}$ and otherwise only bank financing. In case (b), $L_i = \frac{\mu D(k)}{n}$ is not an equilibrium for any scale parameter μ such that $\check{\mu} \leq \mu \leq \hat{\mu}$. Here, equilibria have both bond and bank financing if and only if $\mu > \bar{\bar{\mu}}$, where $\check{\mu} < \bar{\bar{\mu}} \leq \hat{\mu}$.

TO BE COMPLETED.

Proof of Propositions 2 and 3. The comparative statics can be obtained in a straight-forward fashion by applying the implicit function theorem to the symmetric equilibrium-condition $U_{L_i}(L^*_i, (n-1)L^*_i) = 0$ under the assumption that $\mu > \overline{\mu}$. This is permissible since the denominator, $U_{L^*_i L^*_i}(L^*_i, (n-1)L^*_i)$, is negative under the assumptions of the propositions.

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.

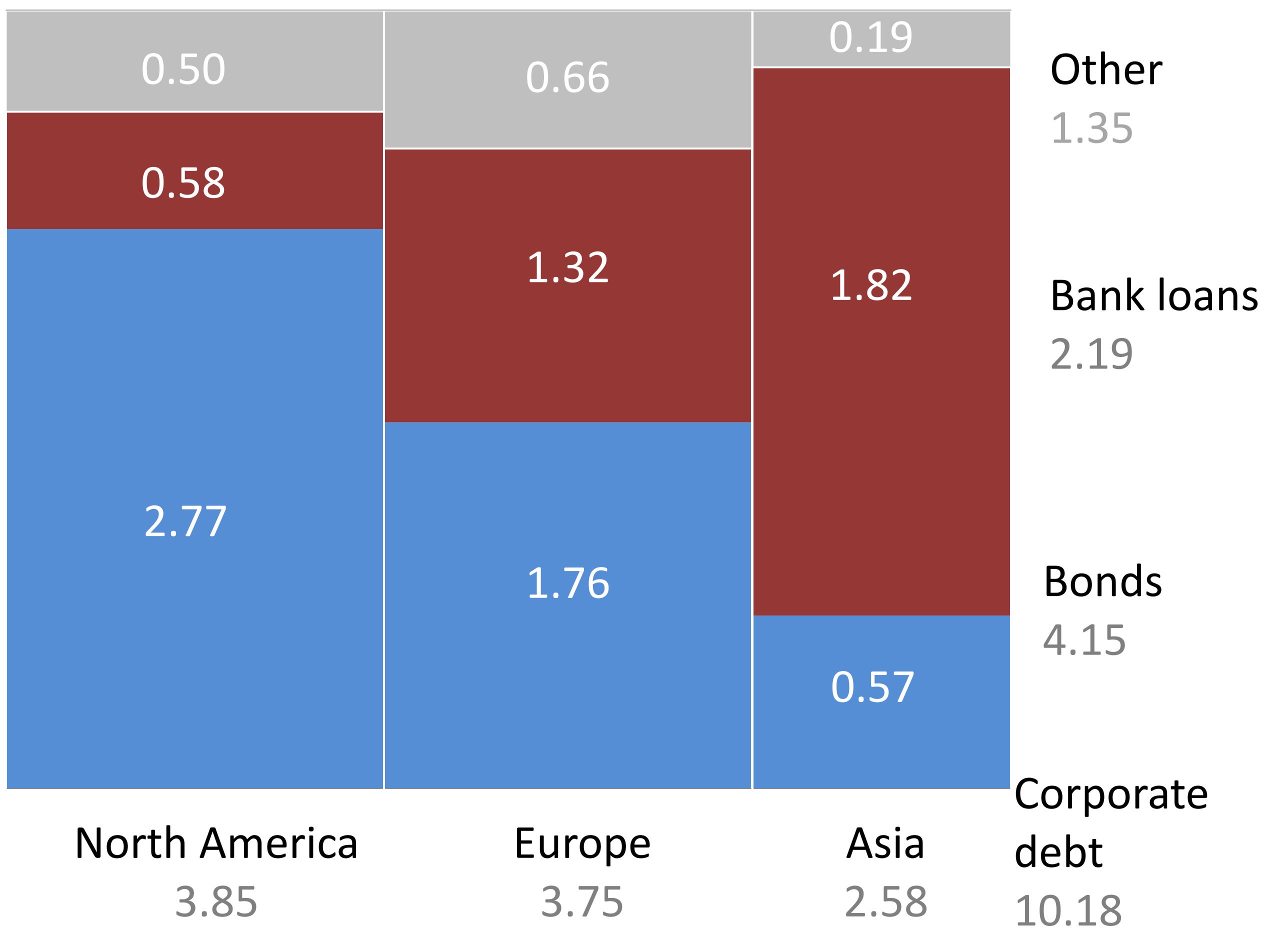


Figure 2. Model predictions

Figure 2a. Fraction of bond financing as a function of bankruptcy efficiency (p) for different default probabilities (q). Numerical solutions based on CRRA utility with coefficient of relative risk aversion 0.4, $n = 10$, $\alpha = -0.9$, $\beta = -0.4$, $\gamma = 0.05$, $\delta = 0.05$, $\mu = 400$, $D(r) = 1 - 0.01r$, and $f = 0.1$.

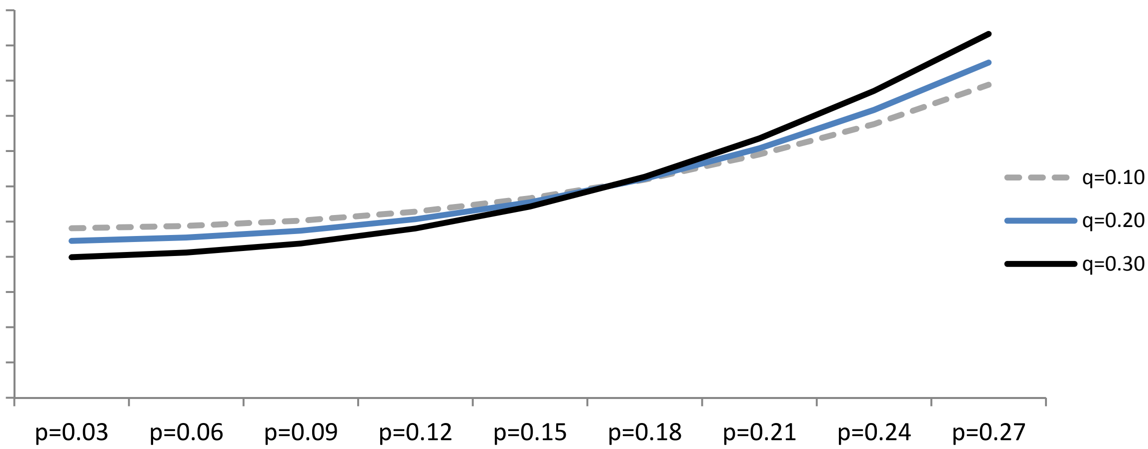


Figure 2b. Fraction of bond financing as a function of the default probability (q) for different degrees of bankruptcy efficiency (p). Numerical solutions based on CRRA utility with coefficient of relative risk aversion 0.4, $n = 10$, $\alpha = -0.9$, $\beta = -0.4$, $\gamma = 0.05$, $\delta = 0.05$, $\mu = 400$, $D(r) = 1 - 0.01r$, and $f = 0.1$.

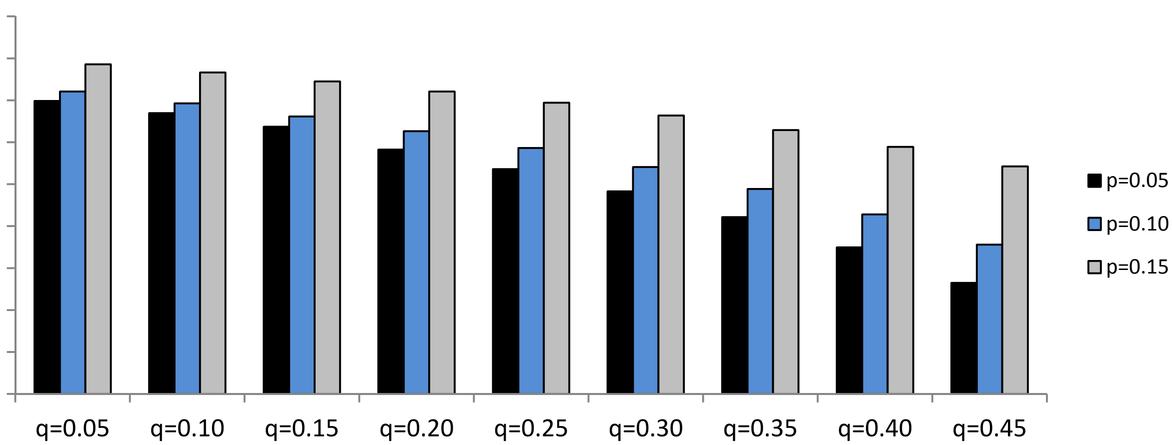


Figure 3. Absolute priority violations for senior debt in and out of court

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 Moodys' 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.

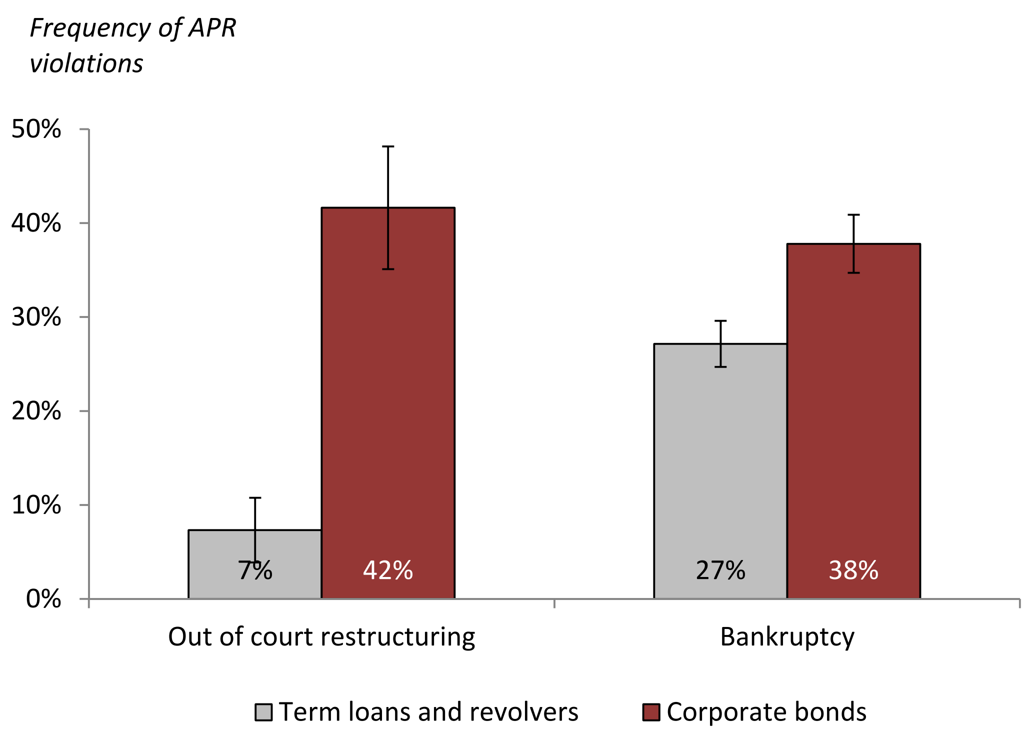
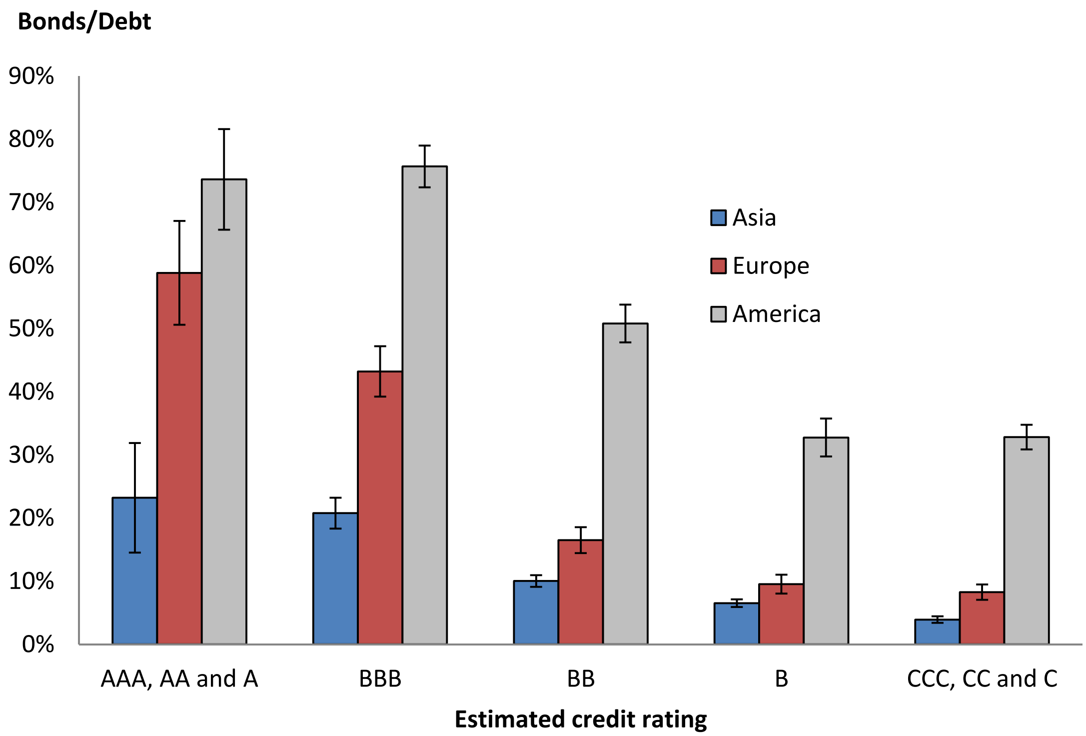


Figure 4. Debt structure by region and credit risk category

The figure presents the share of bonds in total debt for public firms, by region and 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.



	AAA, AA and A	BBB	BB	B	CCC, CC and C
US/Europe ratio	1.25**	1.75***	3.08***	3.44***	3.97***
US-Europe difference	14.8%***	32.5%***	34.3%***	23.2%***	24.6%***

Figure 5. Debt structure around first issuance of bonds

The figure presents the components of debt as a fraction of total assets for firms around the year of a first bond issue. The year in which the bond issue occurs is zero. 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 2000-20011). Countries with more than fifty events are: USA (2,180), Canada (875), Japan (467), India (382), Australia (329), United Kingdom (243), Malaysia (163), France (150), Germany (127), Poland (85), South Africa (70), Greece (68), Sweden (68), Hong Kong (63), Norway (64) and Switzerland (53).

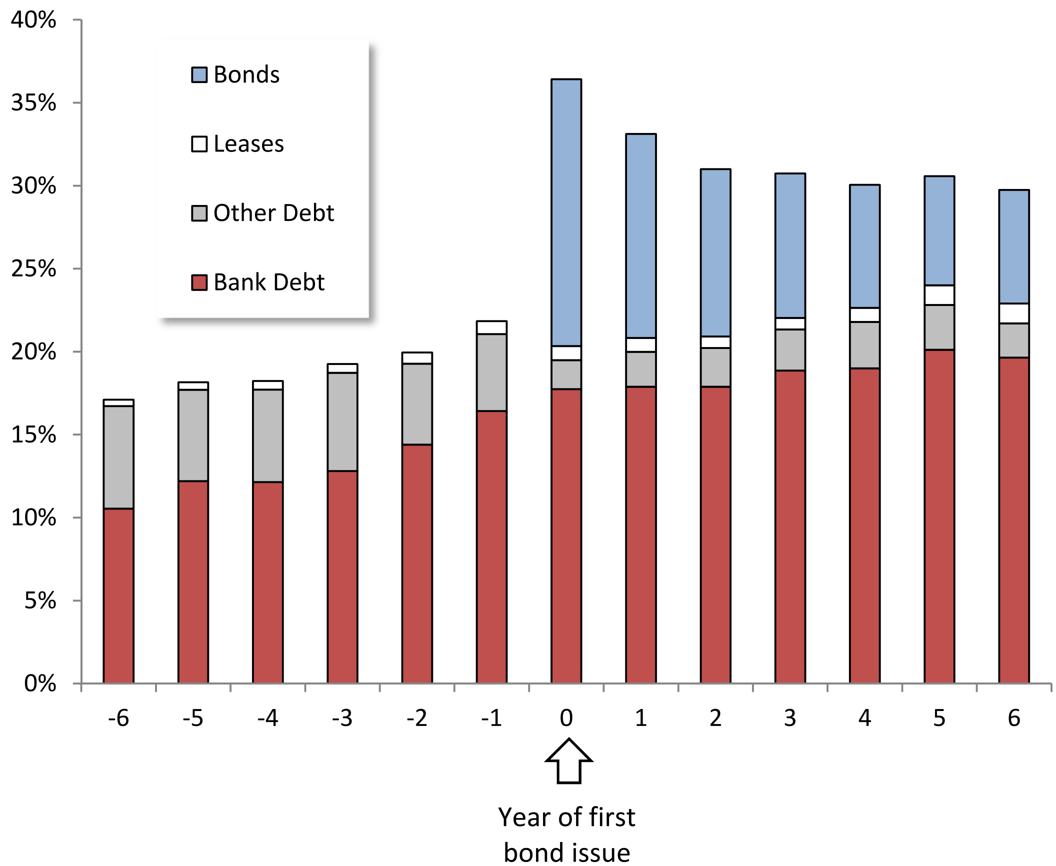


Figure 6. Interest costs around first bond issue

The figure presents interest cost, calculated as the ratio of interest cost to the average of total debt outstanding at the beginning and end of the year. Interest cost is plotted around the year of a firm's first bond issue in the sample. Observations where the interest cost exceeds 0.5 are excluded. There are 2,397 observations for year zero, and 283 for year -6 (the lowest number of observations). The graph shows the average (shaded line), the median (dotted line) and the interquartile range (shaded area) of interest.

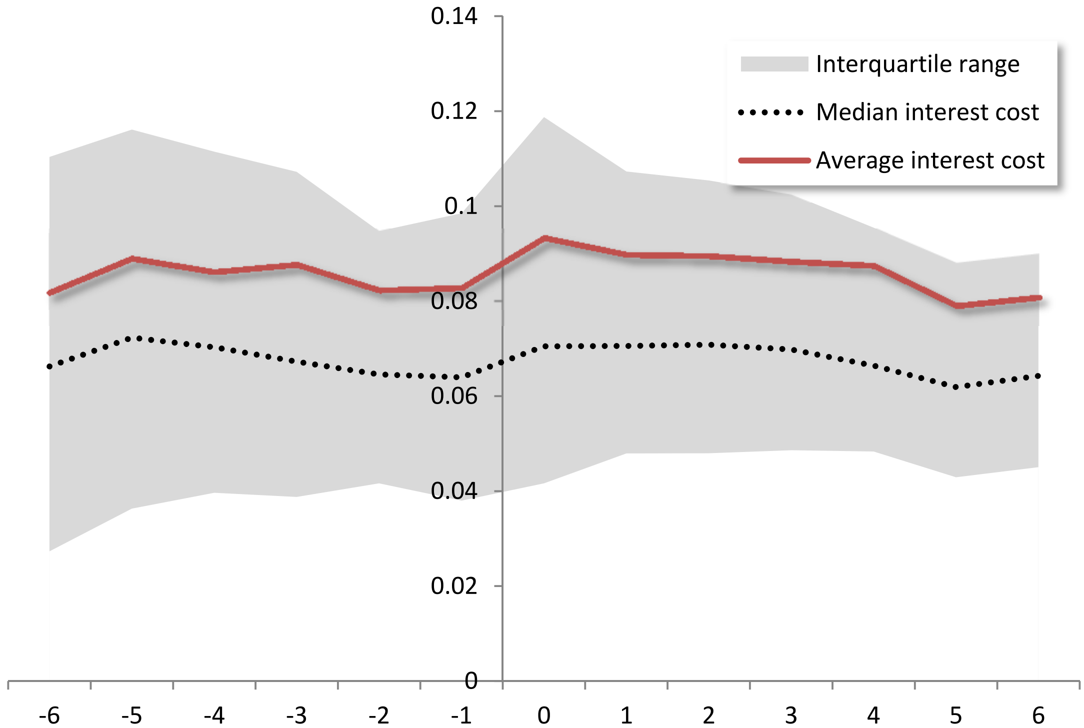


Figure 7. Efficiency of bankruptcy: effect on corporate bond stock

This figure shows the estimated effect of bankruptcy recovery rates, for deciles of credit quality. Firm-years are sorted into groups of 10.1 thousand observations, and the coefficient on the recovery rate is allowed to differ across categories (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 (26.7). 95% confidence intervals are indicated with bars around each column.

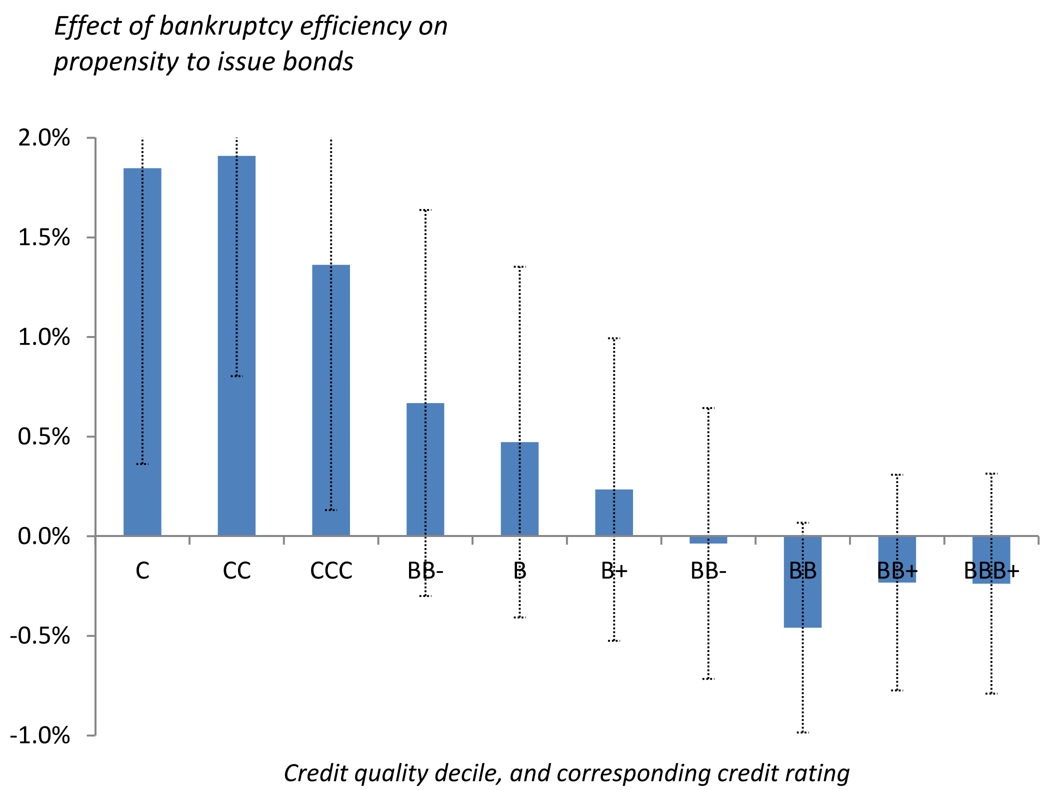


Table 1. Selected summary statistics

Summary statistics are reported in Panel A for variables that vary by firm and year. Rating is the corporate credit rating. For Moody's, 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 is one observation for the purpose of calculating summary statistics here. Only 44 of these countries are represented in our firm sample, and we also report summary statistics across this subsample.

1.A Firm variables

	Mean	Standard dev.	Min	25th perc.	Median	75th perc.	Max
Bond share in debt	0.213	0.333	0	0	0	0.349	1
Bond share in debt, IG firms	0.384	0.370	0	0	0.306	0.740	1
Bond share in debt, HY firms	0.178	0.315	0	0	0	0.217	1
Bond share in debt, ex-US	0.148	0.274	0	0	0	0.173	1
Rating, actual	17.7	3.8	1	15	18	21	28
Rating, estimated	12.7	4.5	1	10.1	13.2	15.8	28
Investment grade	0.167	0.373	0	0	0	0	1

1.B Country variables

	Mean	Standard 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 time (years), 2010	2.90	1.41	0.4	1.9	2.8	4	8
Bankruptcy recovery, sample countries	56.5	26.7	4.4	34.1	64.2	80.2	92.5
Bankruptcy time, sample countries	2.12	1.43	0.4	1.1	1.8	3	6.5

Table 2. Bank loans and bond debt sample: summary statistics

Panel A reports summary statistics on debt capital structure of firms in a sample of international, publicly listed firms, covering 2002-2009. All variables except market leverage and the ratio of bonds to bank loans plus bonds are normalized by total book assets. Other debt is any debt apart from bank loans, bonds, and leases. Panel B reports the frequency of firm-years having bond debt exceeding a threshold, conditional on having or not having bank loans above the same threshold. Results are reported for the following thresholds separately: 1% of assets, 10% of assets, and 20% assets. The difference between high and low bond debt firms in the propensity to have high bank debt is reported for each box. * represents significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

Panel A

	Average	Median	Standard deviation	Number of firm-years
Bank debt	0.13	0.05	0.17	168,512
Revolving credit lines	0.03	0	0.08	170,414
Term loans	0.10	0.01	0.15	168,970
Bonds	0.05	0	0.13	167,196
Leases	0.01	0	0.03	170,821
Other debt	0.03	0	0.09	167,376
Book leverage	0.21	0.16	0.21	163,737
Ratio of bonds to bank loans plus bonds	0.27	0	0.38	121,822
Market leverage	0.24	0.14	0.27	156,913

Panel B

	1% Threshold			10% Threshold			20% Threshold		
	Low bond debt	High bond debt		Low bond debt	High bond debt		Low bond debt	High bond debt	
Low bank debt	80%	20%		83%	17%		89%	11%	
High bank debt	62%	38%	**18%*** **	79%	21%	**3.9%*** **	86%	14%	**2.5%*** **
N	140,408	60,689		163,863	37,309		177,094	24,078	

Table 3. Interest costs around first bond issue

The table presents results for regression of interest cost (the ratio of interest cost to the average of total debt outstanding at the beginning and end of the year) on controls. Leverage is book value of debt to book assets. Market leverage is book value of debt to the sum of market value of equity and book value of debt. Market capitalization is the log of the firms market value of equity measured in US dollars. Book to market is the ratio of book value of equity to market value. Return on assets is the ratio of EBITDA to sales. Cash over assets is total liquid assets divided by lagged book assets. The regression includes indicators for year relative to bond issues, from -6 to 6, but some coefficients are suppressed. 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.

	Interest cost		
	(1)	(2)	(3)
Year -2	**-0.003**	**0.003**	**-0.006****
	0.003	0.003	0.003
Year -1	**-0.005***	**0.001**	**-0.007*****
	0.003	0.002	0.002
Year 0	*-- omitted --*	*-- omitted --*	*-- omitted --*
Year 1	**-0.002**	**0.001**	**0.000**
	0.002	0.002	0.002
Year 2	**-0.001**	**0.001**	**0.000**
	0.002	0.002	0.002
Market capitalization, book to market, ROA, Dividend payer indicator, Cash to assets	No	Yes	Yes
Third-degree polynomials in book and market leverage	No	No	Yes
Firm fixed effects	Yes	Yes	Yes
N	15,451	10,513	10,513
R-squared	0.431	0.579	0.590

Table 4. Bankruptcy efficiency and corporate debt mix

The table shows regressions of the share of debt constituted by bonds for a multi-country sample of public firms. Variable definitions are described in the data section. Safe firms refers to firms whose estimated rating is above 13.53 (this is set to divide the firm-year sample in half). 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.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	All	SAFE FIRMS	RISKY FIRMS	All	SAFE	RISKY	SAFE, ex-US	RISKY, ex-US
Dep. var. mean	0.213	0.248	0.178	0.212	0.247	0.160	0.178	0.120
Bankruptcy recovery	**0.180****	**0.135**	**0.191*****	**0.429*****			**0.023**	**0.148*****
	0.009	0.114	0.060	0.106			0.079	0.048
Recovery * Rating				**-0.019****				
				0.009				
Bankruptcy delays					**0.002**	**-0.024****		
					0.016	0.009		
Creditor rights	**-0.062****	**-0.063****	**-0.048*****	**-0.061****	**-0.065***	**-0.054*****	**-0.012**	**-0.026****
	0.028	0.031	0.017	0.027	0.036	0.019	0.014	0.012
Credit Rating	**-0.026*****	**-0.018**	**-0.025*****	**-**	**-0.018**	**-0.032*****	**0.008**	**-0.021****
	0.008	0.019	0.004		0.016	0.004	0.017	0.010
ROA	**-0.060**	**0.090**	**-0.035**	**-0.059**	**0.088**	**-0.002**	**-0.068**	**-0.015**
	0.081	0.178	0.033	0.080	0.167	0.033	0.149	0.048
Dividend indicator	**0.022**	**0.007**	**0.017***	**0.019**	**-0.015**	**0.022****	**-0.007**	**0.014**
	0.015	0.030	0.009	0.016	0.038	0.009	0.028	0.048
Cash/Assets	**0.133*****	**0.175*****	**0.125*****	**0.131*****	**0.165*****	**0.118*****	**0.173*****	**0.121*****
	0.030	0.060	0.020	0.034	0.061	0.018	0.087	0.027
Market cap., US$	**0.046*****	**0.060*****	**0.013****	**0.045*****	**0.059*****	**0.019*****	**0.025**	**0.021*****
	0.010	0.022	0.006	0.010	0.019	0.006	0.022	0.007
Book-to-market	**-0.010**	**0.023**	**-0.024**	**-0.001**	**0.026**	**-0.021**	**-0.004**	**-0.005**
	0.008	0.020	0.011	0.001	0.017	0.012	0.038	0.008
Volatility	**0.004*****	**0.003**	**0.001***	**0.004*****	**0.002**	**0.001****	**0.006**	**0.001**
	0.001	0.003	0.000	0.000	0.004	0.000	0.004	0.001
Book assets	**0.029*****	**0.038*****	**0.011*****	**0.030*****	**0.054*****	**0.016*****	**0.020**	**0.012***
	0.004	0.011	0.004	0.004	0.009	0.004	0.014	0.006
Volume	**0.158****	**0.161****	**0.136*****	**0.155*****	**0.179****	**0.152*****	**0.033**	**0.159*****
	0.032	0.076	0.029	0.032	0.066	0.034	0.072	0.038
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	124,228	62,049	62,179	124,228	44,130	42,295	49,246	46,216
R-squared	0.170	0.250	0.142	0.171	0.264	0.142	0.172	0.134
Clusters	40	38	39	40	35	36	33	36

Table 5. Bankruptcy efficiency and first time bond issues

The table shows regressions of the share of debt constituted by bonds for a multi-country sample of public firms. Variable definitions are described in the data section. Safe firms refers to firms whose estimated rating is above 13.53 (this is set to divide the firm-year sample in half). 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.

	First time bond issue (indicator)			
	(1)	(2)	(3)	(4)
Sample	Risky firms	Safe firms	Risky, ex-US	Safe, ex-US
Dep. variable mean	0.046	0.025	0.045	0.028
Bankruptcy recovery	**0.046****	**-0.007**	**0.056*****	**-0.001**
	0.017	0.007	0.017	0.007
Bankruptcy time				
Creditor rights	**0.136**	**0.081**	**-0.161**	**-0.145**
	0.414	0.167	0.335	0.121
Credit Rating	**-0.278*****	**-0.165**	**-0.407*****	**-0.448**
	0.1001	0.340	0.165	0.405
ROA	**-5.28*****	**-0.800**	**-5.850*****	**-0.630**
	1.308	2.379	1.509	2.930
Dividend indicator	**0.206**	**0.207**	**0.168**	**0.481**
	0.646	0.646	0.539	0.866
Cash/Assets	**-0.225**	**0.523**	**0.282**	**0.657**
	0.234	0.517	0.744	0.780
Market cap., US$	**0.207**	**-0.225**	**0.304**	**-0.312**
	0.154	0.234	0.251	0.342
Book-to-market	**-0.502**	**-0.267**	**-0.957****	**-0.994****
	0.371	0.285	0.456	0.379
Volatility	**0.009*****	**0.013****	**0.008***	**0.014**
	0.002	0.053	0.004	0.008
Book assets	**0.203**	**0.173**	**0.781*****	**0.624*****
	0.308	0.271	0.178	0.205
Volume	**2.778*****	**1.012**	**5.226*****	**1.856**
	0.089	1.156	1.211	1.606
Year fixed effects	Yes	Yes	Yes	Yes
N	44,262	56,300	31,924	43,335
R-squared	0.025	0.009	0.024	0.010

Table 6 . Bankruptcy efficiency – using bankruptcy reform as experiment

The table shows country-year level regressions of bond debt shares on average recovery rates and country and year fixed effects. Heteroskedasticity–robust standard errors, allowing first order autocorrelation, are reported below coefficients. * represents significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

	(1)	(2)	(3)	(4)
Dependent variable	Bond share	Bond share, value weighted	90th percentile of bond share	First bond issue
Dep. var. mean	0.131	0.343	0.462	0.023
Bankruptcy recovery	**0.058***	**0.236*****	**0.283*****	**0.028*****
	0.034	0.065	0.108	0.007
Country fixed Effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
N	339	339	339	339
R-squared	0.075	0.205	0.106	0.055