



European Insolvency Law and Firm Leverage

First steps in harmonizing insolvency law across the European Union have been taken. The goal is to strengthen capital markets and foster financing opportunities for firms, especially small and medium sized enterprises. Our study gives insight into the possible effects that changing insolvency law can have on firm capital structure.

We find that strengthening insolvency law has a positive effect on the amount of long-term debt on the balance sheet and a negative effect on short-term debt. These effects are strongest for large firms with a lot of tangible assets and in countries with shorter insolvency procedures.

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European insolvency law and firm leverage

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Abstract

In this paper we investigate the effect of insolvency law on firm capital structure in European member states. Using an extensive and unique firm-level information for almost 2 million European firms, we find that strengthening insolvency law has a positive effect on firms' long-term leverage. A further analysis shows that this is (partly) offset by a decrease in short-term leverage. Furthermore, the increase in long-term leverage appears to be mainly driven by the improvement of debtor rights. This novel insight supports the finding that the demand-side channel, rather than merely the supply side channel, is an important factor driving the effect of insolvency law on firm capital structure.

Key words: bankruptcy, investor protection, microdata, capital structure, creditor rights

JEL classification: G15, G32, G33, K22

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1 Introduction

The European Union has taken first steps to harmonize insolvency law across member states. The goal is to strengthen capital markets and foster and diversify financing opportunities for firms, especially small- and medium sized enterprises (SME's). The substantial differences in insolvency regimes has been marked as one of the biggest obstacles for a true Capital Markets Union (CMU) in Europe (Bhatia *et al.*, 2019). In June 2019 the EC adopted the so-called *Restructuring and Second Chance Directive*, allowing a "viable business in distress to be rescued and honest but bankrupt individuals to be given a second chance".¹ More recently, in December 2022, the European Commission proposed another directive for harmonizing certain aspects of insolvency law. The proposed directive aims to converge member state's insolvency law in three aspects: (i) maximizing firm value, (ii) improving efficiency of insolvency procedures both in terms of cost and length (especially for micro-enterprises) and (iii) improving predictability and fair distribution of value amongst creditors.² It is unclear what the effect of these measures will be on firm's financing choices.

In this paper we investigate the effect of strengthening insolvency law on firm capital structure.³ Even though bankruptcy itself is relatively uncommon, of all firm exits in Europe in 2019 less than one percent were due to bankruptcy,⁴ it can still influence financing choices ex-ante. Our results show that improving insolvency law has a positive effect on long-term leverage and a negative effect on short-term leverage. In other words, firms change their debt maturity structure in reaction to changes in insolvency law. These effects are strongest for large firms with a lot of tangible assets. Our main findings are robust to a wide set of specifications and using other proxies for capital structure, different levels of clustering and various (sub-)samples.

These results are relevant in terms of financial stability as debt maturity structures impact firm resilience. Longer debt maturities make firms less vulnerable to interest rate spikes and credit crunches. Recent research conducted during the Global Financial Crisis shows that firms with shorter debt maturities decrease their investment more than those with more long-term debt on their balance sheets (Duchin *et al.*, 2010, Almeida *et al.*, 2012 and Vermoesen *et al.*, 2013).

We delve further into the underlying mechanisms. We find some supportive evidence that

¹See the Proposal for a Directive harmonizing certain aspects of insolvency law of the European Commission, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016PC0723>.

²For more information on the proposed directive see the website of the European Commission: https://ec.europa.eu/commission/presscorner/detail/en/qanda_22_7349.

³Unfortunately, we cannot look into the effects of harmonisation itself as that is still a recent and ongoing development.

⁴See Annex 4 of the impact assessment of the proposed directive harmonizing certain aspects of insolvency law, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022SC0395>.

the demand-side channel is the more important factor in the relationship between insolvency law and firm capital structure. Furthermore, by interacting the strength of insolvency law with measures of judicial efficiency we find that the effect of improving insolvency law is lower in countries with lengthy insolvency procedures. This indicates that long procedures reduce the impact of improvements in insolvency law.

Our research makes several contributions to the existing literature. First, we evaluate the impact of insolvency law improvements on capital structure of non-listed companies. Most research so far has either looked at macro-economic outcomes (see e.g. La Porta *et al.*, 1998 and Djankov *et al.*, 2007), bank-lending portfolio's (see e.g. Esty & Megginson, 2003 and Qian & Strahan, 2007) or the effect of institutions on listed companies (see e.g. Cho *et al.*, 2014).⁵ Secondly, we use a fixed effects panel estimator. Previous papers have either looked at cross-sectional relationships (see e.g. La Porta *et al.*, 1998, Djankov *et al.*, 2007) or the effect of a single change in insolvency law within one country (see e.g. Rodano *et al.*, 2016 and Araujo *et al.*, 2012). Panel regression estimation helps with tackling issues of reverse causality. Furthermore, due to our fixed effects estimator, we look at the average effect of improving insolvency law on the capital structure of individual firms. This allows us to take structural differences between firms and countries into account. These contributions are possible due to extensive and unique dataset. For firm financials we use Bureau van Dijk's *Orbis Historical* microdataset with data on almost 2 million EU firms over a fifteen year period (2004-2019).

Another contribution we make to the literature is that we evaluate the impact of insolvency law as a whole. Previous papers have mostly looked at the effects of strengthening creditor rights on firm capital structure (such as Giannetti (2003), Haselmann *et al.* (2010) and Cho *et al.* (2014)). This is only a part of the story, insolvency law encompasses both the rights of debtors and creditors of financially distressed firms. Though the theoretical and empirical literature addresses elements of the effect of insolvency law on firm capital structure, it is still inconclusive about the total effect. To address this, we use a broad indicator of insolvency law, the World Bank's *Strength of Insolvency Framework* index, which includes both elements. This also allows us to delve deeper into the underlying mechanisms.

From a theoretical perspective, the effect of improving insolvency law on firm capital structure can go both ways. When a firm is in financial distress and there are multiple creditors, there is a common pool problem. Insolvency law essentially boils down to a government mandated collective bargaining procedure. These laws aim to strike a balance between two goals: (1) ex-ante efficiency, which is defined at minimizing incentives for moral hazard, and (2) ex-post

⁵Though there are some exceptions. For example Giannetti (2003) and Haselmann *et al.* (2010) look at the effect of creditor rights on firm capital structure. They both use a forerunner of Orbis Historical called Amadeus. However, they cannot estimate a panel regression model due to the fact that the creditor rights index they use does not have a lot of variation over time.

efficiency, which is defined as maximization of the value of the liquid or insolvent firm (Hart, 2000).⁶ Ensuring ex-ante efficiency mostly entails strengthening creditor rights by punishing defaulting entrepreneurs, while promoting ex-post efficiency can allow some leniency for defaulting firms. Both can have effects on the demand for and supply of credit. Therefore, it is an empirical question what the effect of insolvency law is on firm capital structure.

So far, the focus of similar research has been the effect of strengthening creditor rights. A substantial body of research gives evidence that supports the fact that when creditor rights are stronger, supply of credit increases. For example, La Porta *et al.* (1998), Djankov *et al.* (2007) show that credit markets are bigger in countries with strong creditor rights. Furthermore, there is ample evidence that strengthening creditor rights improves lending conditions: lower interest rates, longer maturities and lower collateral requirements (Qian & Strahan, 2007; Bae & Goyal, 2009; Araujo *et al.*, 2012; Rodano *et al.*, 2016; Giannetti, 2003; Fan *et al.*, 2012 and Davydenko & Franks, 2008). A consequence of improving lending conditions could be an increase in demand for debt.

The demand-side mechanisms have only been looked at by a hand-full of papers. They show that strengthening creditor rights can also decrease demand for debt. Acharya *et al.* (2011) show that strong creditor rights can increase risk-aversion in entrepreneurs, causing a decline in investment. Cho *et al.* (2014) show that strong creditor rights have a negative effect on long-term leverage. Similarly, Fan *et al.* (2012) find that the amount of long-term debt on the balance sheet increases when bankruptcy procedures are more likely to end in reorganization (rather than liquidation). The effect of debtor rights on firm capital structure has received even less attention.⁷ Therefore, by looking at insolvency law as a sum of both debtor and creditor rights, we add to the existing literature.

To conclude, we make several contributions to the literature. We look at insolvency law as a whole, rather than just the effect of strengthening creditor rights. We have an extensive and unique dataset that allows us to estimate a fixed effects panel regression model using balance sheet data of mostly SME's. We find that strengthening insolvency law has a positive effect on long-term leverage and a negative effect on short-term leverage. This shift in maturity structure can improve firm resilience. Furthermore, these effects are strongest for large firms with a lot of tangible assets and in countries with faster insolvency procedures. Lastly, we find supporting evidence that the demand-side channel is more important in determining the relationship between insolvency law and firm capital structure.

⁶Hart (2000) actually defines a third goal: respect of contracts. We however consider this as part of the goal of optimizing ex-ante efficiency.

⁷There is a broad strand of the literature that investigates the relationship between the protection of (minority) shareholders on firm capital structure (see e.g. La Porta *et al.*, 1998 and Djankov *et al.*, 2008b). However, this part of investor protection dictates the rights of shareholders vis-a-vis each other and vis-a-vis management. This is different than the rights of the debtor (shareholders and management) during insolvency.

The remainder of this paper is structured as follows. In section 2 we discuss relevant theory and in section 3 we discuss the empirical literature. In section 4 we delineate our methodology. This is followed by a description of our data in section 5. We present our results in section 6 and our robustness checks in section 7. Chapter 8 concludes the paper.

2 Theoretical Framework

In this section we explore the theoretical literature that looks into the relationship between insolvency law and firm capital structure. We see that bankruptcy costs can influence a firm's optimal level of leverage. These costs are not set in stone and are affected by the institutional environment, especially the design of insolvency law. We also expand on how demand for and supply of debt-financing can be affected by changes in insolvency law. Finally, we look at how the debt-maturity structure in a firm can also be influenced by the design of insolvency law. We see that the theoretical literature gives insights into how insolvency law can affect optimal leverage choices in firms. However, there is no prediction to be made on the size and direction of the effect. That is an empirical matter.

2.1 Bankruptcy costs and the firm financing mix

In their seminal work on optimal capital structure Modigliani & Miller (1958) show that in a world without frictions and with perfect capital markets, a firm cannot create value by changing its financing structure. Any change in the debt-equity ratio that could increase return would be offset by an increase in risk. The average cost of capital, and therefore firm value, remains constant. However, once the tax deductibility of interest payments is taken into account, firms can increase their value by increasing leverage (see e.g. Modigliani & Miller, 1958 and Modigliani & Miller, 1963). In practice, this would suggest a infinite optimal leverage of almost zero equity (Solomon, 1963). This is at odds with the empirical observation that most firms have at least some equity.

One of frictions discussed in the literature that could counterweight this strong demand for debt is the existence of bankruptcy costs (Robichek & Myers, 1966, Baxter, 1967, Hirshleifer, 1970, Scott Jr, 1976 and Kim, 1978). Though some, such as Miller (1977) and Haugen & Senbet (1978), posit that bankruptcy costs alone are unlikely to be of a sufficient magnitude to offset the enormous tax benefits of debt. Agency costs of debt and information asymmetry are also likely important determinants of firm capital structure (Haugen & Senbet, 1978). In this paper we focus on bankruptcy costs.

There are both direct and indirect costs associated with bankruptcy. Direct costs entail the costs related to the procedure itself: lawyers' and accountants' fees, other professional fees

and the value of managerial time spent in bankruptcy (Warner, 1977). The indirect costs of bankruptcy are a lot broader. Warner (1977) describes costs including lost sales, lost profits, and inability of the firm to obtain further financing. Scott Jr (1976) and Shleifer & Vishny (1992) add that during bankruptcy there is a loss of value due to the fact that the firm's productive assets are often sold at a discount in imperfect secondary markets. Lastly, though not a cost in terms of lost value, managers suffer a cost in terms of loss in reputation or status, or even loss of management perks (Dewatripont *et al.*, 1994).⁸

All in all, the existence of bankruptcy costs decreases potential firm value. Highly levered firms are more likely to go bankrupt and therefore have a higher chance of incurring these costs (Kraus & Litzengerger, 1973). Myers & Pogue (1974) show that firms facing higher bankruptcy costs choose lower levels of debt. A firm therefore reaches debt capacity well before full-debt financing (Kim, 1978). As argued by Robichek & Myers (1966), optimal capital structure therefore constitutes a balance between the tax rebate due to deductibility of interest payments from corporate tax and the disadvantages of leverage.

2.2 Designing insolvency law

The institutional and legal framework that shape insolvency procedures, insolvency law, influence costs of bankruptcy for both creditors and debtors. Designing insolvency law is not simple. On one hand, the design has to take into account that a distressed firm value should be maximized. Which could mean that a firm's debt is restructured rather than that the firm is liquidated. On the other hand, morally hazardous behavior should be punished and therefore the penalizing element of a debt contract should remain intact. This subsection delves further into this trade-off.

The extension of any type of credit comes with the risk that the debtor is unable to repay. Without legal insolvency procedures a creditor has two options for recourse: (1) a secured creditor can seize the asset or (2) the creditor can ask the court to sell some, or all, of the firm's assets. If a firm defaults on multiple debt obligations simultaneously and some or all secured creditors run to seize their assets, firm value may be unnecessarily depleted. In other words, in the case of simultaneous default, there is a coordination problem (or common pool problem, see e.g. Finch, 1997). To mitigate the common pool problem, insolvency law transforms the rights of each individual creditor into collective right of recourse (see, e.g., Armour *et al.*, 2001).

There are three potential outcomes to a firm in financial distress going through an insolvency procedure: reorganization, being sold as a going concern and liquidation. One important goal

⁸The loss of these perks or reputation can affect managerial decisions on how much debt to take on. On the one hand there is the argument that this potential for loss can cause managers to be overly cautious, this is shown by Acharya *et al.* (2011). On the other hand, it can also cause managers to gamble for resurrection, once the firm has hit troubled waters, and take on even more debt. Both can affect (potential) firm value.

of insolvency law is designing it in such a manner that it is ex-post efficient: the outcome of the procedure should maximize firm value (Hart, 2000).

The second goal insolvency law should take into account is ex-ante efficiency, which entails penalizing moral hazard by preserving the bonding role of debt. A debt contract is an obligation to repay the principal with interest. To the extent that the debtor does not have sufficient assets to cover all its debts, a common sign of insolvency, managers and shareholders should be penalized during bankruptcy to ensure that the creditor is paid back as much as possible (Hart, 2000).⁹

These goals are potentially trade-offs. Hart (2000) posits that ex-post efficiency can entail that some lenience is given to companies in financial distress in cases that this would maximize firm value. Of the three possible outcomes of insolvency, two by definition leave some value for shareholders: reorganization and being sold as a going concern. In the case of liquidation, the argument can be made that some value should be left for shareholders. Even promising business ventures can fail for reasons outside the power of the shareholder or manager. Knowing one has nothing left to lose can encourage going for broke behavior and delaying filing for bankruptcy. Both can diminish the value of the firm. Aiming for ex-post efficiency would therefore entail some leniency toward the debtor. Consequently, a design of insolvency law that provide such leniency are often labeled as 'debtor-friendly'.

However, aiming for ex-post efficiency, by leaving some value for shareholders may maximize firm value when insolvency is already looming, can decrease ex-ante efficiency. Diminishing the bonding role of debt can entail more room for moral hazard, such as self-enriching, low-effort or overtly risky behavior by the debtor (Hart (2000)). Such behavior diminishes the potential value of the firm. The opposite can also be true, extreme penalization during bankruptcy can incentivize overtly risk-averse behavior and hamper credit provision by investors (Acharya *et al.*, 2011). Such regimes are often labeled as 'creditor-friendly'.

Not every aspect of insolvency law implies trade-offs between ex-ante and ex-post efficiency. An example is reducing information asymmetry by improving transparency. This could be done by credit or collateral registries, mandatory public access to accounting information or granting creditors access to certain information during insolvency procedures. Increased transparency improves ex-ante efficiency. In that case, the firm will suffer less from information asymmetry and therefore reduce the tendency to start hazardous behavior. It will also decrease monitoring and transaction costs. Yet, it does not affect the decision on the most valuable outcome of an

⁹Hart (2000) separately names the respect of contract law as a goal of bankruptcy. In our view this goal essentially exists to ensure ex-ante efficiency. A debt contract prescribes that the debt must be repaid, with interest. This discourages moral hazard and/or self-enriching behavior. If contracts are respected, then there is less incentive for moral hazard and such. The bonding role of debt is preserved and the design of insolvency law is ex-ante efficient.

insolvency procedure and therefore does not affect ex-post efficiency.

2.3 The effect of insolvency law on the supply and demand for debt

Insolvency law influences the ex-ante and ex-post value of a firm and therefore the cost of bankruptcy. Any change therein can affect the willingness to supply and demand credit simultaneously. These effects can work in opposite directions. The interplay of these demand and supply side effects determines the equilibrium capital structure of a firm.

The supply side. An important factor in creditors' willingness to lend are their possibilities for recourse once a firm has defaulted and their (relative) position during an insolvency procedure vis-a-vis the manager or shareholders and other creditors. A creditors' position can be strengthened by increasing opportunities for (coordinated) recourse, forcing repayment, claiming collateral, or gaining control of the firm. The strong position of the creditor disciplines the firm and reduces the risk of morally hazardous behavior and even strategic default (Bolton & Scharfstein, 1996). This decrease in risk for the creditor should lead to an increase in the willingness to lend.¹⁰ In this case, credit supply can expand and/or lending conditions improve: lower interest rates, longer maturities and lower collateral requirements. Another way in which to improve the position of a creditor is improving transparency and thereby lessen information asymmetry, and thus improve upon the incentive to provide credit (Stiglitz & Weiss, 1981 and Pagano & Jappelli, 1993).

A change in insolvency law can also involve a change in debtor rights. Debtor-friendly insolvency regimes allow for some value to be left for the shareholders. Mostly, this happens through allowing for renegotiation of the debt contracts in stead of liquidating the firm (Frouté, 2007). When insolvency law requires that some value is left for the shareholder or manager may diminish the possibilities for full recourse, which can increase risk-taking behavior and lead to a decrease in supply and a deterioration of lending conditions.

The demand side. The effects of creditor and debtor rights on the willingness to borrow work in the opposite direction, similar to the impact on the willingness to extend credit. Strengthening the position of debtors during insolvency usually implies leaving some value for the shareholders or allowing management to stay on during the time that the insolvency procedure is settled. This decreases the costs of bankruptcy for the debtors and provides incentives to managers to prevent the use of a strategic bankruptcy.¹¹ Due to this, the demand for credit increases as it can create more value for the firm and hence for the shareholders and managers (Berkovitch *et al.*, 1998).

¹⁰These dynamics are posed in power theories discussed by Aghion & Bolton (1992), Townsend (1979), Hart & Moore (1994) and Hart & Moore (1998) among others.

¹¹For non-business loans, Gropp *et al.* (1997) show that wealth protection (similar to improving debtor rights) makes risk-averse borrowers better off which will lead to an increase in the demand for credit.

Strengthening the position of creditors during insolvency has the opposite effect on the willingness to borrow. Higher leverage increases the chances of bankruptcy and therefore the likelihood of punishment to the shareholder and manager *ex-ante*.¹² A wish to avoid this punishment may decrease demand for debt and therefore investment, even to the detriment of firm value.¹³ Furthermore, the increase in the creditors' bargaining power, which is what happens when creditor rights are strengthened, may lead to increased pressure to liquidate the firm when the firm runs into financial trouble. This effect is called the liquidation bias (see, e.g., Aghion *et al.*, 1992 and Hart *et al.*, 1997), and can be to the detriment of the value of the firm.

When talking about the demand for debt, it is important to not that debtor-friendly bankruptcy laws are not the only important determinant. First, the corporate tax rebate on interest payments allow firms to create private value by increasing leverage above a social optimum. Not only that, taking on more debt can be used to transfer wealth from existing creditors to shareholders. This can happen if creditors are not able to adjust their risk exposure by demanding higher interest rates once the firm has taken on more debt (Dewatripont *et al.*, 1994). Admati *et al.* (2018) show that this effect is present even when new debt issuance would completely undermine firm value. Once leverage of a firm is in place, shareholders have very little incentive to lower leverage, and actually want to accumulate debt to strengthen their own position. They call this the *leverage ratchet effect*.

Insolvency law thus encompasses both supply and demand factors, depending for example on whether the changes in the law are debtor- or creditor-friendly oriented. This impacts both the willingness to lend by creditors, and to borrow by managers and shareholders. The observed capital structure of a firm is a result of interplay of these mechanisms.

2.4 Debt maturity structures

Not only the debt-equity mix is affected by insolvency law. Insolvency law could also affect the maturity structure of debt within the firm. There could be elements of insolvency law that might benefit either the provision of longer-term debt or shorter-term. And this may play out in the optimal maturity structure of debt (see, e.g., Brick & Ravid, 1985).

If creditors have little bargaining power and few possibilities to demand repayment of debt, firms can choose, deliberately, to stop making repayments on a debt contract. This is called strategic default. As a disciplining device, lenders can choose to extend debt with shorter maturities. Berkovitch *et al.* (1998) show that well designed insolvency law makes strategic

¹²An extreme example may be illustrative. A couple of hundred years ago, debtors who didn't repay their debts were put in debtor prisons. Rajan & Zingales (2014) describe that the abolishment of this practice spurred an enormous increase in the demand for debt. Not to mention, limiting this penalizing element to debt contracts is on an important reason for the existence of limited liability firm.

¹³This is shown by Acharya *et al.* (2011).

default less attractive and can increase maturities.¹⁴

Unclear and inefficient bankruptcy procedures create uncertainty about the direct and indirect costs of bankruptcy. Consequently, this creates uncertainty about a firm's value. Kane *et al.* (1985) and Sarkar (1999) argue that firms with lower variability in value issue longer-term debt than those firms whose value is highly variable. Ergo, clear and efficient bankruptcy procedures can improve certainty in firm value estimation and therefore increase long-term leverage in a firm.¹⁵

The theoretical literature presented above makes a strong case that the optimal firm capital structure is affected by bankruptcy costs and therefore the design of insolvency law. This effect goes further than the mere debt-equity mix, as it also affects the demand and supply forces and the optimal maturity structure of debt. The theoretical literature is, however, less clear on which of these factors dominate and whether firms will thus end up with more or less long-term leverage after changes in the insolvency law. Empirical literature could give insight into these matters.

3 Empirical literature

The research question in this paper is yet to be addressed empirically. It however does relate to several strands of the literature. First, there is a broad body of research on the relationship between creditor rights (which one aspect of insolvency law) and lending (see e.g. La Porta *et al.* (1998) and Djankov *et al.* (2007)). Another strand of the literature looks into the relationship between creditor rights and lending conditions (see e.g. Qian & Strahan (2007) and Bae & Goyal (2009)). More closely related to our research question are the studies evaluating the relationship between creditor rights and firm capital structure (see e.g. Giannetti (2003) and Haselmann *et al.* (2010)). Lastly, we know from the theoretical literature that bankruptcy costs can be relevant for firm capital structure. We therefore also discuss some empirical papers that look into judicial efficiency, which is an important driver of bankruptcy costs, and its relationship with insolvency law and lending (see e.g. Peek & Rosengren (2005) and Acharya *et al.* (2019)).

3.1 Creditor rights, lending and lending conditions

There is an extensive strand of the literature that looks into the relationship between creditor rights and lending. Starting with La Porta *et al.* (1998), who develop indices to determine the

¹⁴Another way to increase bargaining power is by decreasing information asymmetry. This can be done through relationship lending. Degryse & Ongena (2005) and Petersen & Rajan (1994) show that when the lender has more information, due or proximity and long-term relationships, maturities are longer.

¹⁵We also know from Stiglitz & Weiss (1981) that information asymmetry about the likelihood of default causes credit rationing.

strength of creditor rights and shareholder protection. For creditor rights they develop a four-point index with the following factors: (i) no automatic stay on assets;¹⁶ (ii) secured creditors paid first; (iii) restrictions for going into reorganization and (iv) management does not stay during reorganization. In a sample of 49 countries, La Porta *et al.* (1997) find that there is a strong correlation between the strength of creditor rights and the size of debt markets. This is confirmed by Djankov *et al.* (2007) who use a broader sample of 129 countries and a renewed, but similar, four-point creditor rights index.

This positive relationship between the strength of creditor rights and lending is also seen in studies that use bank-lending data. When creditor rights are stronger, banks increase the supply of their lending (Haselmann *et al.*, 2010 and Rodano *et al.*, 2016). This effect is even stronger in the case of lending by foreign banks (Qian & Strahan, 2007 and Haselmann *et al.*, 2010).

A similar but slightly different strand of there literature looks at the relationship between creditor rights and lending conditions. Mostly concluding that when creditor rights are strong, lending conditions, such as interest rates, collateral requirements and maturities.

There is ample evidence that stronger creditor rights are associated with lower interest rates. Araujo *et al.* (2012) use quasi-experimental approach from a change in creditor rights in Brazil, and show that this leads to a decrease in the cost of debt. In Italy, an evaluation of the subsequent easing and strengthening of creditor rights (on different factors) in consecutive years, Rodano *et al.* (2016) show that interest rates increased when creditor rights were weakened but decreased when they were strengthened. Qian & Strahan (2007) and Bae & Goyal (2009) use data on loans to listed companies from over 40 countries in the period 1994 - 2003 and show that interest rates are lower in countries with stronger creditor rights.

The effect on the length of maturities is a little more mixed. Using the same dataset Qian & Strahan (2007) find that maturities are longer when creditor rights are stronger. Bae & Goyal (2009) find that enforceability of contracts, rather than creditor rights per sé, is a more important driver of loan maturity.

Lastly, Davydenko & Franks, 2008 compare bankruptcy laws in France, Germany and the United Kingdom and find that banks respond to weak creditor rights by demanding more collateral.

3.2 Creditor rights and capital structure

Another body of research, most related to our research question, evaluates the relationship between creditor rights and capital structure. The evidence is slightly more ambiguous than

¹⁶An automatic stay on assets entails that once insolvency procedures have begun, secured creditors are not allowed to seize their collateral.

that on the relationship between creditor rights and lending on a more macro-economic scale and lending conditions.

Using a forerunner of the Orbis Historical dataset we use in this paper called Amadeus Giannetti (2003) and Haselmann *et al.* (2010) show that strengthening creditor rights leads to an increase in leverage in unlisted firms. Haselmann *et al.* (2010) looks at fifteen thousand firms in the twelve Eastern European transition economies in the period 1995-2002. Giannetti (2003) uses data from sixty-two thousand firms in eight European countries in the period 1993-1997.

At the firm-level the evidence on the relationship between lending and creditor rights is slightly more ambiguous. However, the evidence leans in towards there being a positive relationship between the two. Giannetti (2003) and Haselmann *et al.* (2010) both use a forerunner of our Orbis dataset, Amadeus, and show that strengthening creditor rights increases firm leverage for unlisted firms. Haselmann *et al.* (2010) looks at fifteen thousand firms in the twelve Eastern European transition economies in the period 1995-2002. Giannetti (2003) uses data from sixty-two thousand firms in eight European countries in the period 1993-1997.

In a different, quasi-experimental approach, Araujo *et al.* (2012) shows that strengthening creditor rights increases both the total amount of debt and long-term debt in Brazilian firms as compared to the control group of Argentina, Mexico and Chile.

There is also evidence to the contrary. Cho *et al.* (2014) use data from Worldscope on listed companies and show that strengthening creditor rights decreases long-term leverage in firms. This is especially the case when management is not allowed to stay in control of the firm during insolvency procedures and reorganization options are limited. Fan *et al.* (2012) also look at listed companies and finds that in countries where reorganization (rather than liquidation or foreclosure) are most likely, firms have higher leverage and more long-term debt. Restrictions into going into reorganization is considered a creditor right according to the La Porta *et al.* (1998) index. A consequence of this possible negative effect on strong creditor rights on the demand for debt is portrayed by Acharya *et al.* (2011). They show that increasing creditor protection decreases risk-taking and firm investment.

3.3 Insolvency law and judicial efficiency

Another strand of the literature concerns itself with the relationship between insolvency law, insolvency procedures and judicial efficiency. For example, Djankov *et al.* (2008a) show that lengthy, costly and inefficient bankruptcy procedures seem to be a global phenomenon. On top of that, they show that insolvency law in many countries, especially those with a French legal origin,¹⁷ often leads to economically inefficient outcomes where viable firms' assets are liquidated

¹⁷La Porta *et al.* (1998) differentiate four categories of legal traditions that are relevant for investor protection: (English) common law, French Civil Law, German Civil Law and Scandinavian Civil Law.

unnecessarily.¹⁸

Previous research has also looked into the relationship between judicial efficiency, creditor rights and incidence of bankruptcy. Claessens & Klapper (2005) and Claessens *et al.* (2003) find that bankruptcies are more frequent in countries with strong creditor rights (except for those with an automatic stay on assets) and in countries with an efficient judicial system. In that sense, strong creditor rights could be a potential substitution for inefficient judicial systems.

A similar but slightly different strand of the literature investigates the relationship between judicial efficiency of insolvency procedures, weak banks and zombie lending. Weak banks, especially if they are not forced to take losses on their non-performing loans, have an incentive to gamble for resurrection and keep extending loans to insolvent firms (Peek & Rosengren, 2005 and Acharya *et al.*, 2019). Evidence from Europe shows that this relationship is even more pronounced in countries with inefficient judicial systems with costly and lengthy insolvency procedures (Andrews, 2019). Consolo *et al.* (2018) show that deleveraging of non-performing loans happens faster in countries with economically and judicially more efficient insolvency regimes.

4 Methodology

In this study we estimate the effect of improving insolvency law within firms across countries over time. Due to our unique and extensive dataset, which is discussed in section 5, we add to the literature by using a different methodological approach: a multivariate panel regression model. Other papers have either looked at cross-sectional relationships (i.e. La Porta *et al.*, 1998 and Djankov *et al.*, 2007) or effects of single changes in creditor rights within one country (i.e. Rodano *et al.*, 2016 and Araujo *et al.*, 2012). We discuss our methodology in this section.

4.1 The Model

The baseline specification used in our study is:

$$Leverage_{i,t} = \alpha_i + \alpha_t + \beta Insolvency\ law_{j,t} + \gamma X_{i,j,t} + \mu_{i,t} \quad (1)$$

The equation is estimated for firms i , in country j , for time t . Leverage is long-term leverage in most of the specifications, we include time- α_t and potential firm-fixed effects α_i ,¹⁹ Insolvency law is measured by the *Strength of Insolvency Framework* index, and its subindices, and the set of controls X_{it} as presented in Section 5.3. We cluster standard errors at the country-level, which

¹⁸The *Strength of Insolvency Framework* index as it is constructed by the World Bank is based on their methodology.

¹⁹For our baseline model, including all controls, we apply the Hausman test to determine if a fixed- or random-effects model suits the data best. The test shows that a fixed effects model is the more suitable estimation structure.

corresponds with the level of our independent variable.²⁰ To ensure that our model is robust we estimate the model with and without several of the control variables and once only using the countries which actually change their insolvency law.

In order to further investigate underlying mechanisms we vary with the independent and dependent variables. First, we look at what could be the cause of an increase in long-term leverage. To do this we estimate the baseline specification with three different outcome variables: short-term leverage, total leverage and the equity ratio. This way we can give insight into whether the changes in long-term leverage are absolute, or whether there is substitution away from other liabilities. In other words, we aim to answer the question of whether the firm financing structure actually changes. On the basis of the theoretical and empirical literature it is hard to make a prediction on the direction of the effect.²¹

Finally, we study whether the impact of changes in insolvency law runs mainly via demand or supply mechanisms. Previous research looking at macro-economic outcomes such as the size of debt markets and lending conditions find that stronger creditor rights are associated with larger debt markets and better lending conditions. However, the effects of changes in creditor rights at the firm level are more ambiguous (see section 3). Our extensive index on insolvency law, which includes sub-indexes on both debtor and creditor rights, allows us to delve deeper into the underlying mechanisms. If the demand-side channel is most important in driving an increase in long-term leverage when insolvency law improves, then (a) strengthening of creditor rights should lead to a decrease in long-term leverage and (b) strengthening debtor rights should lead to an increase in long-term leverage. If the supply-side channel is more important we would expect opposite effects.

4.2 Endogeneity concerns

Often the relationship between legal institutions and economic outcomes is fraught with endogeneity problems. This can make it difficult to estimate a causal effect. However, in this case, there are reasons to be less concerned.

First, in the case of investor protection, which includes the design of insolvency law, the legal tradition is old and institutions tend to be very stable over time. It is therefore extremely unlikely that current capital structure determines investor protection. La Porta *et al.* (1998) show

²⁰An important note has to be made about the clustering of standard errors for a sample with very large N. As for example MacKinnon *et al.* (2023) shows, in this case clustering of standard errors at the firm level (with very large N) could misrepresent the p-value as it asymptotically pushes the p-value towards zero, and therefore cause coefficients to be significantly different from zero. For this reason we decide to cluster our standard errors on a country level, as firms in a particular country all face similar economic and financing conditions that are particular to a country. Later in section 7.2 we show that choosing clustering at the firm-level or country-industry-level yield very similar outcomes.

²¹For a discussion of the literature see sections 2 and 3.

that investor protection is strongly correlated with "legal origin": common law, French civil law, German civil law or Scandinavian civil law. For most of the world's countries, their legal origin is determined by which European country they were colonized.²² For example, they find that French civil law countries have weaker investor protection compared to common law countries.

Secondly, most countries seem to only improve insolvency law over time.²³ Average leverage on the other hand, moves with the business cycle and therefore in both directions (see figure 2). We would be more concerned with endogeneity if countries also weakened (certain aspects) of insolvency law, especially during economic crises.

All in all, we estimate a multivariate panel regression model to estimate the effect of changes in insolvency law within firms across countries over time. This is possible due to our extensive and unique dataset on firm balance sheets and allows us to add to the literature.

5 Data

First, we use the World Bank's *Strength of Insolvency Framework* index as our indicator for insolvency law. This allows us to look at insolvency law as a whole, rather than creditor rights in isolation. Similar papers looking at the relationship between bankruptcy procedures and firm capital structure (such as Giannetti (2003), Haselmann *et al.* (2010) and Cho *et al.* (2014)), use the 4-point creditor rights index first developed by La Porta *et al.* (1997).²⁴ Using this broader index allows us to delve deeper into the underlying mechanisms governing the effect of insolvency law on firm financing choices. Moreover, the *Strength of Insolvency Framework* index has more variation over time than the standard measures of creditor rights. This allows us to estimate a multivariate panel regression model. In section 5.1 we discuss this indicator further.

The rich multi-country, though unbalanced, panel we build using Bureau van Dijk's *Orbis Historical* offers further novelties. This dataset covers balance sheet information on almost 2 million, mostly unlisted, firms in 27 EU countries over the period 2004-2019. This allows us to add to the literature by looking at the effect of bankruptcy procedures on firm financing decisions in small and medium sized enterprises (SME's), rather than just listed firms as was the case in Cho *et al.* (2014). On top of that, the long time dimension enables us to estimate the effect of improvements in insolvency law on firm capital structure over time. Previous literature often looks at the effect of single changes in insolvency law within one country (i.e. Araujo *et al.*, 2012, Rodano *et al.*, 2016) or cross-sectional relationships (i.e. La Porta *et al.*, 1998 and

²²La Porta *et al.* (1997) use legal origin as an instrument for investor protection in their cross-country study of the relationship between investor rights and size of capital and debt markets.

²³Within our sample the only exception is Croatia. The weakening of insolvency law that happens there is short and temporary. See table 2 and figure 1.

²⁴For a discussion of the literature on the relationship between creditor rights and capital structure see section 3.2.

Djankov *et al.*, 2007). In section 5.2 we further discuss the Bureau van Dijk’s firm balance sheet data.

5.1 Measuring the strength of insolvency law

The main proxy we use to measure the strength of insolvency law is the *Strength of Insolvency Framework* index. This is the legal component of the broader *Resolving Insolvency* indicator which, in turn, is an element of the World Bank’s *Doing Business* reports. These yearly reports include twelve indicators on the ease of doing business such as: starting a business, shareholder rights, getting credit, paying taxes and resolving insolvency. These elements of the Doing Business report include both quantitative and qualitative measures.²⁵ The part of the broader Resolving Insolvency indicator which includes both quantitative and qualitative measures of how well insolvency is resolved in a country.²⁶

The *Strength of Insolvency Framework* index, which we label *Insolvency Law* in our tables, is a legal evaluation of insolvency procedures and what a country’s law dictates about how they are to be conducted and who has the right to what. The index is designed in such a manner that a full score would lead to an economically efficient outcome: where viable firms are rehabilitated and nonviable ones are liquidated.²⁷ In other words, the balance between ex-ante and ex-post efficiency is optimal with a full score on the *Strength of Insolvency Framework* index. To determine whether the written laws facilitate this, local insolvency practitioners answer sixteen questions on insolvency procedures and the position of debtor’s and creditors during these proceedings.

The *Strength of Insolvency Framework* index comprises of four subindices: commencement of proceedings, creditor participation, management of debtor’s assets, and reorganization proceedings. Table 1 describes the sub-indices in detail. In order to disentangle supply and demand-side effects we classify each of the sub-indexes as either creditor or debtor-friendly. The creditor friendly sub-indices are *Creditor participation* and *Getting Credit Legal*, the debtor-friendly indices are *Management of debtor’s assets* and *Reorgazation proceedings* and we codify *Commencement of proceedings* as neutral:

- *Creditor participation*: this sub-index essentially measures how much control, information and veto-power individual creditors have.

²⁵Each country receives a score between 0 and 100 on each of the indicators, where 100 is the best regulatory practice. Each indicator is made up of qualitative and quantitative measures of how easy that aspect of doing business is in each country.

²⁶For more information see <https://archive.doingbusiness.org/en/data/exploretopics/resolving-insolvency>.

²⁷A certain score does not indicate the procedure being more or less creditor or debtor friendly, or which goal (ex-ante or ex-post efficiency) is given more weight in insolvency proceedings.

- *Management of debtor's assets*:²⁸ This sub-index is mainly concerned with maximizing firm value during insolvency. For example, it allows for the possibility to attract so-called post-commencement financing and whether this is given priority over other (unsecured) creditors. Rules as such increase the chance that the firm can be sold as a going concern or reorganized but dilutes the claim of existing creditors.
- *Reorganization proceedings*: this sub-index describes whether court-supervised reorganization is possible and who votes on the plan. If reorganization is possible, the punishing role of debt and bankruptcy law is diminished. Furthermore, reorganization proceedings often weaken the position of individual creditors vis-a-vis other creditors.
- *Commencement of Proceedings*: is an objective question on which stakeholders, creditors and debtors, are allowed to start an insolvency procedure.

Lastly, we take another index from the *Doing Business* report: *Getting Credit Legal*. This index includes an evaluation of the written law concerned with creditor rights and securitization of collateral. This index does not only concern creditor rights in insolvency procedures but also looks at possibilities for collateralization and its registration. We include it in some of the analyses because it most closely resembles the creditor rights, developed by La Porta *et al.* (1997), La Porta *et al.* (1998) and Djankov *et al.* (2008a), that has been used extensively in similar research.²⁹

The rest of this subsection discusses the indices' descriptive statistics. Table 2 displays the mean and standard deviation of the main index of insolvency law, the *Strength of Insolvency Framework* index, and its subindices over our period of interest (2004-2020). We also display the descriptives of the *Getting Credit Legal* index.

The indices of insolvency law run from 0 to 16, with 16 being the highest score possible. The average level of insolvency law across all EU countries is 11.87. The strength of insolvency law varies quite substantially within the EU. For example, a low score is observed in Cyprus (4) and Malta (5.5) whilst Portugal (14.5) and Germany (15) are close to the maximum value of the indicator. This shows that the legal insolvency law framework in some countries is stronger than in others. Interestingly, both the *Creditor Participation* index and the *Getting Credit* legal index is very low across the EU. This indicates that European creditors have not been protected well from firm default in the past two decades.

²⁸Though the name of the sub-index is slightly confusing, this index does not say anything about how much of the assets are distributed to the debtors in the insolvency process. A more accurate description would be "management of the distressed firm's assets".

²⁹For more information see <https://archive.doingbusiness.org/en/methodology/getting-credit>.

Table 1: Subindices of the Strength of Insolvency Framework index

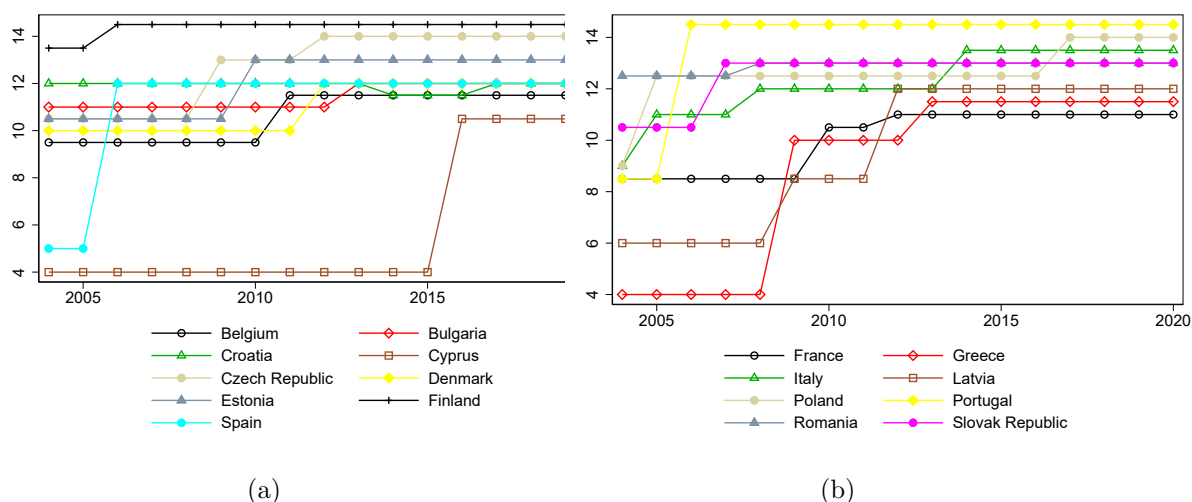
| Subindex | Score | Measures | Debtor- or creditor friendly |
|-------------------------------|--------------|---|-------------------------------------|
| Commencement of proceedings | 0-3 | i) Whether debtors can initiate both liquidation and reorganization proceedings, ii) whether creditors can initiate both liquidation and reorganization proceedings, and iii) what standard is used for commencement of insolvency proceedings. As this sub-index is about the start of insolvency procedures we do not characterize it as strictly debtor-friendly or creditor-friendly. | Neutral |
| Creditor participation | 0-4 | i) creditors appoint the insolvency representative or approve, ratify or reject the appointment of one, ii) whether creditors are required to approve the sale of substantial assets of the debtor, iii) whether an individual creditor has the right to access financial information about the debtor, and iv) whether an individual creditor can object to a decision of the court or of the insolvency representative to approve or reject claims against the debtor brought by the creditor itself and by other creditors. | Creditor-friendly |
| Management of debtor's assets | 0-6 | i) whether the debtor can continue performing contracts essential to the debtor's survival, ii) whether the debtor can reject overly burdensome contracts, iii) whether transactions entered into before commencement of insolvency proceedings that give preference to one or several creditors can be avoided after proceedings are initiated, iv) whether undervalued transactions entered into before commencement of insolvency proceedings can be avoided after proceedings are initiated, v) whether the insolvency framework includes specific provisions that allow the debtor, after commencement of insolvency proceedings, to obtain financing necessary to function during the proceedings, and vi) whether post-commencement finance receives priority over ordinary unsecured creditors during distribution of assets. | Debtor-friendly |
| Reorganization proceedings | 0-3 | i) whether the reorganization plan is voted on only by the creditors whose rights are modified or affected by the plan, ii) whether creditors entitled to vote on the plan are divided into classes, each class votes separately and the creditors within each class are treated equally, and iii) whether the insolvency framework requires that dissenting creditors receive as much under the reorganization plan as they would have gotten in liquidation. | Debtor-friendly |

Table 2: Descriptive statistics on insolvency law (2004-2020)

| | Insolvency law | Commencement of proceedings | Creditor participation | Management of debtor's assets | Reorganization proceedings | Getting credit |
|---------------|----------------|-----------------------------|------------------------|-------------------------------|----------------------------|----------------|
| AT | 11.00 (0.00) | 2.50 (0.00) | 2.00 (0.00) | 5.50 (0.00) | 1.00 (0.00) | 4.00 (0.00) |
| BE | 10.55 (1.00) | 2.50 (0.00) | 2.00 (0.00) | 5.05 (1.00) | 1.00 (0.00) | 4.27 (1.00) |
| BG | 11.78 (0.42) | 2.50 (0.00) | 3.78 (0.42) | 3.00 (0.00) | 2.50 (0.00) | 8.00 (0.00) |
| CY | 4.00 (0.00) | 2.00 (0.00) | 0.00 (0.00) | 2.00 (0.00) | 0.00 (0.00) | . |
| CZ | 13.09 (1.38) | 2.50 (0.00) | 2.40 (0.81) | 5.19 (0.61) | 3.00 (0.00) | 5.89 (0.90) |
| DE | 15.00 (0.00) | 3.00 (0.00) | 3.00 (0.00) | 6.00 (0.00) | 3.00 (0.00) | 6.15 (0.32) |
| DK | 12.00 (0.00) | 3.00 (0.00) | 2.00 (0.00) | 6.00 (0.00) | 1.00 (0.00) | 8.00 (0.00) |
| EE | 11.89 (1.24) | 2.28 (0.25) | 3.00 (0.00) | 5.50 (0.00) | 1.12 (0.99) | 6.56 (0.50) |
| ES | 11.19 (2.24) | 2.88 (0.32) | 0.88 (0.32) | 5.54 (1.28) | 1.88 (0.32) | 5.00 (0.00) |
| FI | 14.42 (0.27) | 3.00 (0.00) | 2.92 (0.00) | 6.00 (0.27) | 2.50 (0.00) | 6.00 (0.00) |
| FR | 9.72 (1.19) | 3.00 (0.00) | 0.52 (0.50) | 5.52 (0.50) | 0.69 (0.24) | 3.63 (0.63) |
| GR | 8.49 (3.37) | 2.32 (0.24) | 1.00 (0.00) | 3.55 (1.98) | 1.62 (1.20) | 2.00 (0.00) |
| HR | 11.89 (0.21) | 2.89 (0.21) | 2.00 (0.00) | 4.00 (0.00) | 3.00 (0.00) | 4.80 (0.54) |
| HU | 10.00 (0.00) | 2.50 (0.00) | 2.00 (0.00) | 5.00 (0.00) | 0.50 (0.00) | 7.78 (1.47) |
| IT | 12.79 (1.07) | 3.00 (0.00) | 1.88 (0.32) | 4.96 (0.72) | 2.94 (0.33) | 2.00 (0.00) |
| LT | 8.00 (0.00) | 2.50 (0.00) | 1.00 (0.00) | 4.00 (0.00) | 0.50 (0.00) | 5.11 (0.86) |
| LU | 7.00 (0.00) | 2.50 (0.00) | 1.00 (0.00) | 3.00 (0.00) | 0.50 (0.00) | 3.00 (0.00) |
| LV | 11.27 (1.69) | 2.47 (0.12) | 1.83 (0.37) | 4.89 (0.46) | 2.08 (0.93) | 9.00 (0.00) |
| MT | 5.50 (0.00) | 2.50 (0.00) | 1.00 (0.00) | 2.00 (0.00) | 0.00 (0.00) | 2.00 (0.00) |
| NL | 11.50 (0.00) | 2.50 (0.00) | 2.00 (0.00) | 6.00 (0.00) | 1.00 (0.00) | 2.28 (0.25) |
| PL | 13.15 (1.18) | 2.98 (0.11) | 1.55 (0.50) | 5.95 (0.21) | 2.68 (0.54) | 6.84 (0.31) |
| PT | 14.50 (0.03) | 3.00 (0.00) | 3.00 (0.01) | 5.50 (0.00) | 3.00 (0.01) | 2.00 (0.00) |
| RO | 12.80 (0.24) | 2.50 (0.00) | 2.00 (0.00) | 5.80 (0.24) | 2.50 (0.00) | 8.68 (0.47) |
| SE | 12.00 (0.00) | 3.00 (0.00) | 2.00 (0.00) | 6.00 (0.00) | 1.00 (0.00) | 6.65 (0.48) |
| SI | 11.50 (0.00) | 2.50 (0.00) | 1.00 (0.00) | 6.00 (0.00) | 2.00 (0.00) | 3.04 (0.16) |
| SK | 12.74 (0.76) | 2.95 (0.15) | 2.80 (0.61) | 4.00 (0.00) | 3.00 (0.00) | 7.00 (0.00) |
| EU average | 11.87 (1.83) | 2.81 (0.29) | 1.87 (0.96) | 5.10 (1.20) | 2.08 (0.84) | 5.17 (2.22) |
| Maximum score | 16 | 3 | 4 | 6 | 3 | 12 |

Note: the table displays the mean (st.dev.) of the indicators of insolvency law over the full sample (2004-2020). The main index is the Strength of Insolvency Framework index of the Worldbank as our proxy of insolvency law. AT = Austria, BE = Belgium, BG = Bulgaria, CY = Cyprus, CZ = Czech Republic, DE = Germany, DK = Denmark, EE = Estonia, ES = Spain, FI = Finland, FR = France, GR = Greece, HR = Switzerland, HU = Hungary, IT = Italy, LT = Lithuania, LU = Luxembourg, LV = Latvia, MT = Malta, NL = Netherlands, PL = Poland, PT = Portugal, RO = Romania, SE = Sweden, SI = Slovenia, SK = Slovakia.

Figure 1: Changes in the strength of insolvency law



Note: the figure only displays the countries for which a change in the strength of insolvency law has occurred over our sample period.

Not all countries have implemented a change in the insolvency framework during our period of interest. Figure 1 displays all the countries that have reformed insolvency law in the period 2004-2020.³⁰ Of the 27 EU countries, 11 countries have not had any reforms. Their values in 2 are constant over the period and therefore have a standard deviation of zero.

Greece stands out in Figure 1a. The strength of insolvency law in Greece jumps from 4 to 10 in 2009. At the start of the financial crisis, the Greek government implemented a new bankruptcy law. In order to encourage reorganization of financially impaired firms, this reform included a possibility for defaulting companies to proceed as going concern. At the same time, the law ensured an equal treatment of creditors. Another increase for Greece from 10 to 11 took place in 2013, when it abolished the conciliation procedure and introduced a new rehabilitation proceeding. This was also part of the restructuring program to receive government support.

There is only one country in our sample for which the strength of insolvency law, temporarily, decreases. The index falls from a steady 12 to 11.5 in 2014 and returns to 12 in 2017. Croatia introduced an expedited out-of-court restructuring procedure in 2014. Due to the fact that some of the details were yet to be ironed out, this was considered a weakening of the strength of insolvency law. Once this was realized the index for Croatia returned to its original level.

Another country that experienced a substantial increase is Spain. Their index jumps from 5 to 12 in 2006. In this year, the Spanish government introduced several reforms at the same time. These reforms made it easier for employers to convert workers' contracts from fixed to

³⁰For detailed information on the exact reforms that were implemented by these countries see <https://subnational.doingbusiness.org/en/data/exploretopics/resolving-insolvency/reforms>.

open ended, fees for property registration were lowered, it increased disclosure of related-party transactions, reduced profit taxes, appeals to insolvency no longer suspended debt recovery, statutory deadlines for bankruptcy proceedings were shortened, and defined duties for directors and controlling shareholders (protecting investors).

Large jumps are also seen in Latvia, from 6 to 8.5 in 2009, and to 12 in 2012. In 2009 Latvia introduced a new insolvency law that allowed financially distressed firms to continue their operations in the course of insolvency, and with stronger qualification standards for bankruptcy administrators. In 2012, a new insolvency law was adopted streamlining the insolvency process and included a new reorganization option for companies.

5.2 Microdata on firm balance sheets

In this paper we use data from the largest global microdataset, Bureau van Dijk’s Orbis Historical, which includes firm financial information (Kalemli-Özcan *et al.*, 2022). The data is collected from local chambers of commerce, or similar organisations, and harmonised for comparability. The data includes firms financial statements (i.e. the amount of debt, equity and assets) and firm performance measures such as sales, return on assets, employment and investment. Furthermore, there is detailed information a firms’ location and industry. Key advantages of this dataset are the extensive coverage of firms over time and the availability of SME data, rather than merely data on listed companies. Our final dataset, used in our main specifications, includes unconsolidated balance sheet data on 1,6 million firms and 7,4 million firm-year observations across 27 EU countries in the period 2004-2019. Using unconsolidated data ensures that we do not double count financial information from companies that also belong to a consolidated entity.

Several steps have to be taken to construct a clean and relevant sample from the Orbis Historical microdata. First, we follow the cleaning procedure prescribed by Kalemli-Özcan *et al.* (2022).³¹ We further drop firms if their accounting identities do not add up in any given year, when equity, current or non-current liabilities is negative. We drop firms with negative equity as it distorts the measures for leverage: in some cases the long-term debt, for example, exceeded the total assets substantially due to the negative equity of firms. Lastly for our research purposes we select non-financial corporate firms that are either private or public limited companies in the period 2004-2019 for EU countries.³²

Our main variable of interest is long-term leverage, which we measure by long-term debt divided by total assets. Long-term debt is defined as loans on which interest is paid with a maturity of longer than one year. Other non-current liabilities such as deferred taxes, pension

³¹The procedure prescribes dropping duplicates, firms with no financial information or other relevant variables, companies with negative total assets, employment sales or tangible fixed assets in any given year, winsorizing at the 99,9 percentile of the distribution for total assets and ratio of employment to total assets and sales.

³²Due to limited coverage in Ireland, Irish companies drop out of our dataset.

liabilities, equalization accounts are not included in our main definition of long-term leverage. Such debt is often not the result of financing choices, rather a consequence of other institutional or market factors. We do look at the ratio of non-current liabilities to total assets in our robustness checks.

Long-term debt is our main variable of interest because it is most strongly correlated with secured debt, which is most likely to be affected by changes in insolvency law. Before an insolvency, a creditor can seize their assets when a debtor defaults. In most countries, this is no longer the case once an insolvency procedure has commenced.

Furthermore, other non-current liabilities such as deferred taxes, pension liabilities, equalization accounts for risks are often not so much to do with financing choices, but are a consequence of other institutional factors. A similar argument can be made for other current liabilities, these are often trade creditors and such. In some countries and industries it is more common to have long payment possibilities, while in others it is not.

To test whether this is due to substitution away from other financing methods, we also look at other measures of firm capital structure. Again our main variable is short-term leverage, which is "loans" over total assets. The variable "loans" in Orbis Historical consists of interest carrying debt with a maturity shorter than one year. Other current liabilities such as trade creditors isn't included in this ratio. Though we do also look at a ratio of current liabilities to total assets in our robustness checks.³³ Finally, we also consider total leverage (*Total leverage*) by taking the sum of short and long-term debt over total assets and for the capital ratio (*Capital Ratio*) we take capital over total assets. This is the actual capital paid in by owners and investor and therefore does not include "other shareholder funds" such as retained earnings and reserves.

In table 3 we display the summary statistics of our leverage measures for all countries in our sample over the period 2004-2019.³⁴ We start our sample in 2004 because since then the World Bank reports the *Strength of Insolvency Framework* index. On average we observe a long-term leverage of 0.11 in the EU for the period 2004-2019. We see a lot of variation across countries. For example, we observe a very low average value for Romania (0.00) and the highest value of 0.26 in Austria.

The low long-term leverage for Romanian corporations stands out. When taking a closer look at the data, we see that Romanian firms hardly report long-term debt or other non-current liabilities. Most of their financing seems to come from equity and other current liabilities (such as trade credit). In their June 2019 survey on financing the National Bank of Romania (2019) find similar financing structures.

³³See section 7 for more information.

³⁴Cyprus is left out of the table as it has only a few observations (3) in our final dataset. Ireland dropped out during the cleaning procedures.

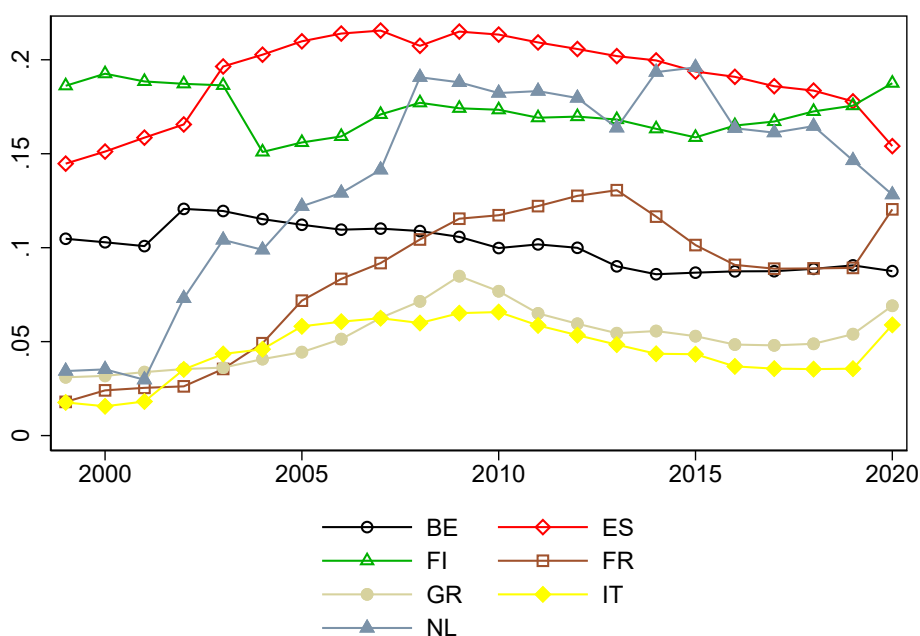
Table 3: Descriptive statistics: leverage and equity ratios

| | Long-term leverage | Short-term leverage | Total leverage | Capital ratio |
|------------|--------------------|---------------------|----------------|---------------|
| AT | 0.26 (0.25) | 0.02 (0.07) | 0.28 (0.25) | 0.04 (0.06) |
| BE | 0.10 (0.15) | 0.07 (0.11) | 0.17 (0.20) | 0.11 (0.14) |
| BG | 0.03 (0.11) | 0.03 (0.09) | 0.06 (0.14) | 0.05 (0.12) |
| CY | | 0.09 (0.07) | 0.09 (0.07) | 0.20 (0.02) |
| CZ | 0.03 (0.09) | 0.04 (0.09) | 0.07 (0.13) | 0.10 (0.15) |
| DE | 0.12 (0.19) | 0.03 (0.09) | 0.15 (0.21) | 0.09 (0.13) |
| DK | 0.05 (0.12) | 0.06 (0.10) | 0.11 (0.16) | 0.06 (0.09) |
| EE | 0.13 (0.18) | 0.08 (0.12) | 0.21 (0.23) | 0.08 (0.12) |
| ES | 0.20 (0.20) | 0.04 (0.09) | 0.25 (0.21) | 0.09 (0.13) |
| FI | 0.17 (0.19) | 0.06 (0.08) | 0.22 (0.22) | 0.03 (0.06) |
| FR | 0.10 (0.16) | 0.04 (0.08) | 0.13 (0.18) | 0.09 (0.11) |
| GR | 0.06 (0.12) | 0.12 (0.16) | 0.18 (0.20) | 0.24 (0.21) |
| HR | 0.09 (0.17) | 0.04 (0.09) | 0.13 (0.19) | 0.09 (0.14) |
| HU | 0.01 (0.05) | 0.01 (0.04) | 0.01 (0.08) | 0.08 (0.11) |
| IT | 0.04 (0.10) | 0.07 (0.12) | 0.12 (0.17) | 0.07 (0.09) |
| LT | 0.14 (0.16) | 0.09 (0.11) | 0.23 (0.20) | 0.12 (0.16) |
| LU | 0.01 (0.06) | 0.03 (0.07) | 0.04 (0.10) | 0.15 (0.16) |
| LV | 0.08 (0.17) | 0.06 (0.13) | 0.14 (0.22) | 0.10 (0.15) |
| MT | 0.07 (0.16) | 0.09 (0.14) | 0.15 (0.22) | 0.05 (0.08) |
| NL | 0.17 (0.19) | 0.02 (0.07) | 0.19 (0.19) | 0.04 (0.09) |
| PL | 0.11 (0.17) | 0.07 (0.11) | 0.17 (0.20) | 0.12 (0.17) |
| PT | 0.18 (0.21) | 0.02 (0.07) | 0.20 (0.22) | 0.09 (0.11) |
| RO | 0.00 (0.03) | 0.01 (0.05) | 0.02 (0.07) | 0.03 (0.09) |
| SE | 0.13 (0.19) | 0.03 (0.06) | 0.16 (0.21) | 0.06 (0.08) |
| SI | 0.17 (0.19) | 0.11 (0.13) | 0.27 (0.21) | 0.08 (0.11) |
| SK | 0.02 (0.07) | 0.05 (0.11) | 0.07 (0.13) | 0.13 (0.23) |
| EU average | 0.11 (0.18) | 0.05 (0.10) | 0.16 (0.20) | 0.08 (0.12) |

Note: the table displays the mean (st.dev.) of long-term leverage over period the 2004-2019. AT = Austria, BE = Belgium, BG = Bulgaria, CY = Cyprus, CZ = Czech Republic, DE = Germany, DK = Denmark, EE = Estonia, ES = Spain, FI = Finland, FR = France, GR = Greece, HR = Switzerland, HU = Hungary, IT = Italy, LT = Lithuania, LU = Luxembourg, LV = Latvia, MT = Malta, NL = Netherlands, PL = Poland, PT = Portugal, RO = Romania, SE = Sweden, SI = Slovenia, SK = Slovakia.

A similar level of heterogeneity can be observed for the other measures of firm capital structure. Greek firms have quite some short-term financing on their balance sheet (0.12) whilst firms in Hungary and Romania have substantially less (0.01). The EU average short-term leverage is 5% of total assets. In terms of equity financing, we see that this is an important source of funding for firms in Greece (0.24) but less so in Finland and Romania (0.03).

Figure 2: Mean of long-term leverage



Note: the figure displays the mean of long-term leverage, long-term debt over total assets, over time for a selection of European countries. See the note on Table 2 for the country classifications.

In figure 2 we show the development long-term leverage over time for a selection of EU countries, showing substantial variation. Long-term leverage is relatively low for firms in Italy and Greece across the entire period of interest. Contrastingly, Spanish and Finnish companies have relatively high long-term leverage over the whole period 2004-2020.³⁵

Though very extensive, the content of the data prevents us from answering some questions that would have also been very interesting in this context. First, we do not know the identity and nationality of the lender or investor. This means that we, unfortunately, cannot give insight into how improving insolvency law affects cross-border lending and whether it fosters a more diverse supply of financing (and therefore decreases bank-dependence in Europe). On top of that, we do not know which of the loans are secured or unsecured whilst the position of those lenders is very different during insolvency. Because our dataset does not include information on these factors, we leave these very interesting questions for future research.

³⁵For the remainder of the text we leave 2020 out of the analysis. The coverage of firm data is substantially less in the last year of our dataset than for other years. There is a reporting lag of almost 2 years for most firms.

5.3 Controls

To take other factors into account that influence firm capital structure, we add three sets of controls to our dataset: institutional indicators, firm-level factors and macroeconomic factors. For our choice of controls we follow the literature, especially Cho *et al.* (2014). In this section we discuss these controls.

The institutional factors we include are a proxy for shareholder rights (the World Bank index for the protection of minority investors) and a dummy for whether the country has a credit registry or bureau.

The literature on investor protection started by La Porta *et al.* (1998) show that both creditor and shareholder rights are important determinants for investment and therefore firm capital structure. Building on La Porta *et al.* (1998), Djankov *et al.* (2008b) show that, in particular, the protection of minority investors from self-dealing practices by management and majority shareholders is strongly associated with size of capital markets. Therefore we control for this relationship including the World Bank's *Protection of Minority Shareholders* index (*Shareholder Rights*). Similar to *Strength of Insolvency Framework* index, it is from the World Bank's Doing Business reports and it concerns the legal rules that govern a standardized case: a dispute between majority and minority shareholders.

The other institutional control we include is a dummy for whether a country has a credit registry or bureau. Information on creditworthiness of firms is shown to have a positive effect on lending (Bos *et al.*, 2015; Doblas-Madrid & Minetti, 2013; Behr & Sonnekalb, 2012; De Janvry *et al.*, 2010).

The second set of controls take stock of the economic conditions of a country affecting the potential availability of credit to firms (see, e.g., Djankov *et al.*, 2007 and Cho *et al.*, 2014). We do so by including year-on-year GDP growth (*GDP*) and year-on-year inflation (*Inf*).

Finally, the third set of controls considers firm-specific information which is considered relevant for lending decisions, relationships and signalling of credit worthiness. We follow Acharya *et al.* (2011) and Fan *et al.* (2012) in that we control for:

- the size of operations of a firm for which we use the logarithm of sales as a proxy (*Sales*);
- the availability collateral in a firm defined as the ratio of tangible fixed assets to total assets (*Tangibility*);
- a firm's return on assets;
- the liquidity ratio defined as current assets over current liabilities; and
- a firm's age.

Table 4: Correlations

| | Long-term leverage | Short-term leverage | Capital ratio | Total leverage | Insolvency Law | Shareholder rights | Credit registry | Inflation | GDP growth | Return on assets | Sales | Tangibility | Liquidity ratio | Age |
|---------------------|--------------------|---------------------|---------------|----------------|----------------|--------------------|-----------------|-----------|------------|------------------|-------|-------------|-----------------|------|
| Long-term leverage | 1.00 | | | | | | | | | | | | | |
| Short-term leverage | 0.02 | 1.00 | | | | | | | | | | | | |
| Capital ratio | -0.08 | -0.05 | 1.00 | | | | | | | | | | | |
| Total leverage | 0.88 | 0.50 | -0.09 | 1.00 | | | | | | | | | | |
| Insolvency law | 0.00 | -0.08 | -0.10 | -0.04 | 1.00 | | | | | | | | | |
| Shareholder rights | -0.08 | -0.07 | -0.12 | -0.10 | 0.07 | 1.00 | | | | | | | | |
| Credit registry | 0.00 | -0.03 | -0.01 | -0.02 | 0.01 | 0.12 | 1.00 | | | | | | | |
| Inflation | 0.00 | 0.02 | -0.01 | 0.01 | -0.24 | -0.21 | -0.07 | 1.00 | | | | | | |
| GDP growth | -0.04 | -0.03 | -0.03 | -0.04 | -0.15 | -0.03 | -0.11 | 0.55 | 1.00 | | | | | |
| Return on assets | -0.18 | -0.14 | -0.08 | -0.23 | -0.03 | 0.15 | -0.01 | 0.04 | 0.10 | 1.00 | | | | |
| Sales | 0.02 | 0.22 | -0.09 | 0.12 | -0.04 | -0.17 | 0.02 | 0.02 | -0.05 | -0.17 | 1.00 | | | |
| Tangibility | 0.41 | 0.05 | 0.07 | 0.38 | -0.00 | -0.09 | -0.01 | 0.05 | -0.00 | -0.16 | 0.04 | 1.00 | | |
| Liquidity ratio | -0.04 | -0.18 | 0.10 | -0.12 | 0.02 | 0.11 | 0.01 | -0.00 | 0.03 | 0.18 | -0.22 | -0.15 | 1.00 | |
| Age | 0.01 | 0.11 | 0.04 | 0.06 | -0.06 | -0.04 | 0.02 | -0.03 | -0.06 | -0.18 | 0.44 | 0.10 | -0.01 | 1.00 |

Table 4 displays the correlation between all variables. There seems to be little concern for multicollinearity issues as the correlation between insolvency law and most other independent variables is rather low. This is even the case for shareholder rights and credit registry, which also affect lending. As expected, these variables are likely important for the financing structure of firms but pick up other effects. We will therefore include these three institutional factors in our main model.

The correlation between the strength of insolvency law and long-term leverage, our main outcome variable, is rather low. Other papers find different baseline correlations. Using cross-sectional country data Djankov *et al.* (2007) find a substantially higher correlation of 0.3 between creditor rights and the size of debt markets. For firm-level data Fan *et al.* (2012) show substantially lower, but positive, correlations (0.07) as well between leverage ratios and the likelihood of a distressed firm being reorganized. However, these measures of creditor rights and likelihood of reorganization are very different than our measure of the strength of the insolvency framework. Namelijk, those indicators focus on only a certain aspect (creditor or debtor rights) and not the balance between them.

6 Results

We find that improving insolvency law has a positive effect on long-term leverage and a negative effect on short-term leverage. Our main result hold across a broad variety of specifications. Variations of the main model and sub-sample regressions give insight into underlying mechanisms.

We find that the effects are stronger for large firms with a lot of tangible assets and the effect decreases in countries with longer insolvency procedures. Furthermore, we find some indications that the demand-side effects are especially important in whether improving insolvency law leads to an increase in long-term leverage. We discuss these results in this section.

6.1 Main results

A one step increase in the strength of insolvency law leads to an increase in long-term leverage of nearly 0.4 percentage points.³⁶ Table 5 shows that this effect is statistically significant and holds across several different specifications.³⁷ Though this effect may seem small, relating it to the average and standard deviation of long-term leverage and changes in insolvency law for a specific country or the EU average illustrates the potential effect. For example, the average long-term leverage in the EU is 0.11 (or 11%, see Table 3). A one-unit change in insolvency law, measured by the standard deviation, for the EU of 1.83 (see Table 2) implies an increase in long-term leverage of around 0.7 percentage points. Thus the average long-term leverage would increase from 11% to 11.7%. The largest impact is for Greece. A one-unit change (standard deviation) in insolvency law would lead to an increase in the average long-term leverage from 6% to almost 7.3%.³⁸

Our results show that there are also other important drivers over long-term leverage. Most importantly, there is a strong path dependency in long-term leverage. Firms with higher leverage in the past, tend to have higher leverage ratios today.³⁹ When including the lagged leverage variable in the model the effect of insolvency law on long-term leverage is halved, yet still positive and statistically significant. We opt, however, not to include the lagged dependent variable in the main specifications for two reasons. First, the observations for each firm in the sample are limited. Including a lag implies a loss of information in the main specification. Second, a dynamic panel raises concerns over the Nickell bias, a potential problematic correlation between the regressor and the error term. As our sample consists of a large N but small T, our model can be prone to this concern. Therefore we opt to exclude the lagged dependent variable from the main specification as displayed in column (1).

³⁶All specifications cluster standard errors at the country-level, the results also hold for other clustering techniques as can be seen in section 7.2.

³⁷A similar estimation of the effect, using only the countries that actually changed their insolvency law during the period of interest, shows a slightly higher but otherwise very similar coefficient of 0.35 percentage points (column 5 of table 5).

³⁸One could also express the effects as so-called beta-coefficients, see e.g. Ezekiel (1930). This approach expresses the estimated coefficients in terms of standard-deviation changes in the dependent and main independent variable: $\hat{\beta} * \frac{\sigma_X}{\sigma_Y}$. With this approach one would make the coefficients more comparable for actual changes in the dependent and independent variable. For Greece this would imply a beta-coefficient of 0.11. This is substantially larger than for example the EU average, for which the beta-coefficient would be 0.04.

³⁹Hennessy & Whited (2005) and Admati *et al.* (2018) find similar results.

Table 5: Impact of insolvency law on long-term leverage

| VARIABLES | (1) | (2) | (3) | (4) | (5) |
|----------------------------|------------------------|------------------------|-----------------------|-----------------------|------------------------|
| Insolvency law | 0.0037** (0.0017) | 0.0019*** (0.0007) | 0.0048** (0.0018) | 0.0049** (0.0019) | 0.0035* (0.0020) |
| Shareholders rights | -0.0016* (0.0009) | -0.0008* (0.0004) | -0.0021** (0.0010) | -0.0022** (0.0010) | -0.0015 (0.0015) |
| Credit registry | 0.0224*** (0.0025) | 0.0086*** (0.0008) | 0.0218*** (0.0024) | 0.0220*** (0.0027) | 0.0216*** (0.0072) |
| Inflation | -0.0003 (0.0010) | 0.0006 (0.0006) | -0.0004 (0.0010) | | -0.0005 (0.0008) |
| GDP growth | -0.0002 (0.0002) | -0.0003 (0.0003) | -0.0002 (0.0002) | | 0.0003 (0.0003) |
| Return on assets | -0.0006*** (0.0001) | -0.0007*** (0.0002) | | | -0.0005*** (0.0001) |
| Sales | 0.0014 (0.0032) | 0.0014 (0.0020) | | | 0.0013 (0.0038) |
| Tangibility | 0.2183*** (0.0302) | 0.1569*** (0.0230) | | | 0.1931*** (0.0218) |
| Liquidity ratio | 0.0033*** (0.0009) | 0.0030*** (0.0008) | | | 0.0033*** (0.0010) |
| Lag of long-term leverage, | | 0.4720*** (0.0325) | | | |
| Age | -0.0029*** (0.0006) | -0.0017*** (0.0003) | | | -0.0028*** (0.0008) |
| Constant | 0.0612 (0.0583) | 0.0198 (0.0324) | 0.1197*** (0.0390) | 0.1165*** (0.0407) | 0.0581 (0.0761) |
| Observations | 7,364,677 | 5,739,167 | 7,555,316 | 7,555,316 | 6,257,288 |
| R-squared | 0.0854 | 0.3217 | 0.0140 | 0.0140 | 0.0721 |
| Number of firms | 1,620,176 | 1,233,309 | 1,677,439 | 1,677,439 | 1,412,161 |
| Firm FE | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | No | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Secondly, other institutions such as shareholder rights and the presence of a credit registry or bureau play an important role in predicting the amount of long-term leverage a firm has. An improvement in shareholders rights, i.e. the World Bank's *Protection of minority investors* index, by one point decrease long-term leverage by around 0.2 percentage points. Rather than an absolute decrease in long term debt on firms' balance sheets, it is more likely that it is due to an increase in the amount of shareholder capital the firm has. La Porta *et al.* (1997)

and Djankov *et al.* (2008b) show that there is a strong correlation between the protection of (minority) shareholders and the size of capital markets.

As has also been shown in previous research, another institutional factor that is an important driver of long-term leverage is the presence of a credit registry or bureau (Bos *et al.*, 2015; Doblas-Madrid & Minetti, 2013; Behr & Sonnekalb, 2012; De Janvry *et al.*, 2010). Firms in countries with credit registries or bureaus seem to have a 2 percentage point higher long-term leverage.

Lastly, firm performance and characteristics are also strongly correlated with long-term leverage. The most important predictor of long-term leverage is the percentage of tangible assets a firm has (as a ratio of its total assets). Rampini & Viswanathan (2013) show that the ability to collateralize assets is an important determinant of capital structure of firms.

6.2 Substitution effects

In table 6 we see that an improvement of insolvency law has a statistically significant negative effect on short-term leverage. To be more precise, a one-step increase in the strength of insolvency law decreases short-term leverage by 0.7 percentage points on average. This result indicates that there is indeed a substitution between the different forms of debt (rather than an absolute increase of debt on the balance sheet of firms). This result corresponds with the theoretical literature. When there is a lot of information asymmetry and insolvency laws are weak and there is little enforcement of debt repayment, short-term debt is used as a disciplining device (see e.g. Berkovitch *et al.* (1998)).

Furthermore, the rest of the balance sheet does not seem to be affected by improving insolvency law. The effect of improvements in insolvency law on total leverage and on the capital ratio (paid-in capital over total assets) is insignificant, and in the case of the latter close to zero. This is evidence that most of the changes in the balance sheet due to improvements in insolvency law are due to substitution rather than an increase in total indebtedness of the firm.

Table 6: Potential substitution in firm financing structure

| VARIABLES | (1) Short-term leverage | (2) Total leverage | (3) Capital ratio |
|-----------------|----------------------------|-----------------------|-----------------------|
| Insolvency law | -0.0073*** (0.0024) | -0.0034 (0.0027) | 0.0001 (0.0013) |
| Constant | 0.1414*** (0.0256) | 0.1982** (0.0771) | 0.3066*** (0.0370) |
| Observations | 7,082,065 | 7,082,065 | 7,364,308 |
| R-squared | 0.0309 | 0.0822 | 0.0601 |
| Number of firms | 1,537,311 | 1,537,311 | 1,620,021 |
| Firm FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6.3 Supply or demand?

If the demand-side channel is most important in driving an increase in long-term leverage when insolvency law improves, then (a) indices focused on creditor rights should lead to a decrease in long-term leverage, as stronger creditor rights weaken the position of debtors. This is especially the case with a larger amount of creditors. Thus stronger creditor rights would lead to lower demand for long-term loans. Yet, (b) indices focused on debtor rights should lead to a increase in long-term leverage. The strengthening of the position of debtors then leads to more demand for long-term debt as it increases firm value.

Our results give supportive evidence that, at the firm-level, the demand-channel is the more important driver of the effect of insolvency law on long-term leverage. First and foremost, we see that there is a positive and statistically significant effect of the debtor-friendly sub-index *Management of debtor's assets* on long-term leverage. A positive, though not statistically significant effect is found for the effect of possibilities for reorganization on long-term leverage. Furthermore, the sub-indexes most concerned with creditor rights (*Getting Credit* and *Creditor Participation*) have a not-statistically different from zero negative effect on long-term leverage. Though not all of the coefficients are statistically significant, the signs are in the direction that would support demand-side mechanisms over the supply effects.

Table 7: Demand or supply effects of insolvency law on long-term leverage

| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) |
|-------------------------------|----------------------|---------------------|---------------------|-----------------------|--------------------|--------------------|
| Insolvency law | 0.0037** (0.0017) | | | | | |
| Getting Credit | | -0.0006 (0.0039) | | | | |
| Creditor participation | | | -0.0006 (0.0023) | | | |
| Management of debtor's assets | | | | 0.0081*** (0.0019) | | |
| Reorganization proceedings | | | | | 0.0032 (0.0052) | |
| Commencement of proceedings | | | | | | 0.0189 (0.0125) |
| Constant | 0.0612 (0.0583) | 0.1102* (0.0539) | 0.1097* (0.0571) | 0.0662 (0.0534) | 0.1020 (0.0603) | 0.0553 (0.0616) |
| Observations | 7,364,677 | 7,364,657 | 7,364,677 | 7,364,677 | 7,364,677 | 7,364,677 |
| R-squared | 0.0854 | 0.0849 | 0.0849 | 0.0858 | 0.0850 | 0.0851 |
| Number of firms | 1,620,176 | 1,620,166 | 1,620,176 | 1,620,176 | 1,620,176 | 1,620,176 |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6.4 Extensions of the model

6.4.1 Heterogeneous effects

The effect of insolvency law changes on long-term leverage is bigger firms (in terms of total assets) and only statistically significant for firms with a lot of tangible assets that can be pledged as collateral. In tables 8, 9 and 10 we report the sub-sample regressions.

Generally, larger firms with more tangible assets tend to be more suitable for debt financing. They are less risky, have more stable cash flows meaning the chances that both the periodic interest payments are made and the principal is repaid are quite high. Furthermore, information asymmetry is likely to be less of an issue for these firms because in most countries, the bigger the firm, the more in-depth financial reporting needs to be. Qian & Strahan (2007) also show similar results. Using a dataset of loans to large corporations in 43 countries they show that the impact of creditor rights is stronger for firms that have more tangible assets.

Table 8: Size (total assets)

| VARIABLES | (1) 1 quartile | (2) 2nd quartile | (3) 3rd quartile | (4) 4th quartile |
|-----------------|--------------------|-----------------------|----------------------|-----------------------|
| Insolvency law | 0.0019 (0.0022) | 0.0002 (0.0025) | 0.0047** (0.0018) | 0.0037*** (0.0008) |
| Constant | 0.0053 (0.0612) | 0.2472*** (0.0660) | 0.2203** (0.0852) | 0.1235* (0.0605) |
| Observations | 1,772,334 | 1,870,467 | 1,870,786 | 1,851,090 |
| R-squared | 0.0645 | 0.1052 | 0.1050 | 0.0580 |
| Number of firms | 705,859 | 618,351 | 464,842 | 298,144 |
| Firm FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Age

| VARIABLES | (1) 0-3 years | (2) 4-10 years | (3) 10 years or older |
|-----------------|---------------------|--------------------|--------------------------|
| Insolvency law | 0.0036* (0.0018) | 0.0015 (0.0018) | 0.0033** (0.0013) |
| Constant | 0.0060 (0.0543) | 0.0794 (0.0479) | 0.1002 (0.0650) |
| Observations | 1,957,338 | 2,070,645 | 3,336,694 |
| R-squared | 0.0693 | 0.0877 | 0.0786 |
| Number of firms | 960,498 | 702,051 | 558,978 |
| Firm FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10: Potential for collateralization (tangible assets)

| VARIABLES | (1) 1st quartile | (2) 2nd quartile | (3) 3rd quartile | (4) 4th quartile |
|-----------------|---------------------|---------------------|---------------------|---------------------|
| Insolvency law | 0.0024 (0.0014) | 0.0009 (0.0019) | 0.0026* (0.0014) | 0.0057* (0.0029) |
| Constant | 0.0603 (0.0421) | 0.1214* (0.0676) | 0.0866 (0.0686) | -0.0024 (0.0759) |
| Observations | 1,871,724 | 1,838,187 | 1,831,869 | 1,822,897 |
| R-squared | 0.0150 | 0.0230 | 0.0493 | 0.1190 |
| Number of firms | 690,959 | 665,752 | 634,057 | 490,363 |
| Firm FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6.4.2 Impact of the efficiency of insolvency procedures

Aside from the rules that govern the course of insolvency, the judicial efficiency of such procedures is known to have an effect on lending by banks. Specifically, banks tend to refinance loans to zombie firms if insolvency procedures are very lengthy (Andrews, 2019 and Peek & Rosengren, 2005). We investigate this effect in this section.

In table 11 we display the results of interacting insolvency law with measures of efficiency of insolvency procedures. Our main take-away is that judicial efficiency matters for the effect of the strength of insolvency law on firm capital structure and can decrease or even take away its effect.

When interacting insolvency law with the length of procedures some interesting mechanisms come to light. First, the effect of insolvency law on long-term leverage improvements more than doubles. Secondly, there is also a positive effect of the length of insolvency procedures on long-term leverage. This was not what we expected a priori. One could expect that long procedures would lead to less supply of and demand for debt, as trust in the system is low. Nonetheless, this could also be a mechanical result.⁴⁰ Firms who are in bankruptcy procedures are likely more leveraged, on average, than firms who are not. They also remain alive for the duration of the bankruptcy procedure and therefore keep reporting balance sheet data.

Lastly, the coefficient for the interaction between insolvency law and the length of procedures

⁴⁰We cannot check for this using our data, but this could be an interesting avenue for future research.

is negative. This indicates that the effect of insolvency law is decreasing in the length of procedures. Though incidence of actual bankruptcy is quite low, the threat of a lengthy procedure or difficulty of legal recourse once a firm defaults could motivate lenders to gamble for resurrection and continue extending debt, especially in a low-interest rate environment.⁴¹

Interacting insolvency law with the cost of procedures and recovery rates causes the effect of insolvency law on firm capital structure to disappear. This is again a message that one can change the law on the books, but if insolvency procedures are too long and too expensive, the actual law on the books loses relevance.

Table 11: Impact of insolvency law and efficiency on long-term leverage

| VARIABLES | (1) | (2) | (3) | (4) |
|--|----------------------|------------------------|---------------------|-----------------------|
| Insolvency law | 0.0037** (0.0017) | 0.0091*** (0.0022) | -0.0002 (0.0039) | -0.0063 (0.0040) |
| Length of insolvency procedure | | 0.0274*** (0.0073) | | |
| Insolvency law * length of the procedure | | -0.0023*** (0.0006) | | |
| Cost of insolvency procedure | | | -0.0029 (0.0028) | |
| Insolvency law * cost of the procedure | | | 0.0003 (0.0002) | |
| Recovery rate | | | | -0.0027** (0.0010) |
| Insolvency law * recovery rate | | | | 0.0002** (0.0001) |
| Constant | 0.0612 (0.0583) | -0.0005 (0.0583) | 0.0932 (0.0770) | 0.1857** (0.0724) |
| Observations | 7,364,677 | 7,364,657 | 7,364,657 | 7,364,657 |
| R-squared | 0.0854 | 0.0858 | 0.0856 | 0.0859 |
| Number of firms | 1,620,176 | 1,620,166 | 1,620,166 | 1,620,166 |
| Firm FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

⁴¹Such effects are shown to exist by Andrews (2019) and Peek & Rosengren (2005)

7 Robustness

In this section we explore the robustness of our results to using different measures for leverage, the clustering technique for standard errors and the selection of countries in our sample.

7.1 Different measures for leverage

In our baseline specification we focus on leverage measures based on balance sheet items that are the closest to pure forms of (bank) lending to calculate long-term and short-term leverage. To see whether our results are robust to a different definition of leverage, here we consider broader categories. Instead of long-term debt, we now include all non-current liabilities as our measure of firm leverage. This implies we also take other forms of debt into account such as accruals and deferred tax liabilities. And for short-term leverage, we consider all current liabilities which also include, for example, payments on account. Lastly, we also take the broader definition of shareholders funds: the equity ratio (which includes other shareholder capital such as retained earnings and reserves).

Table 12 shows that the coefficient on non-current liabilities is very similar to the estimated effect for the more narrow measure of long-term leverage. However, with this measure the effect is not statistically significant. For the ratio of current liabilities to total assets, the estimated effect is smaller than the more narrow measure for short-term leverage. This effect is statistically significant. Apparently, the impact of changes in insolvency law is larger (and statistically significant) for the debt structure of a firm, both long- and short-term debt, as opposed to other (non-)current liabilities. Lastly, also for the broader definition of shareholders funds, the equity ratio, we see that there is no effect of insolvency law.

Table 12: Other measures for leverage

| VARIABLES | (1) Non-current liabilities ratio | (2) Current liabilities ratio | (3) Equity ratio |
|----------------------|--------------------------------------|----------------------------------|-----------------------|
| Insolvency law | 0.0042 (0.0033) | -0.0047** (0.0019) | 0.0005 (0.0039) |
| Constant | 0.0314 (0.0521) | 0.5327*** (0.0725) | 0.4359*** (0.0511) |
| Observations | 7,364,677 | 7,364,677 | 7,364,677 |
| R-squared | 0.0950 | 0.2678 | 0.2454 |
| Number of ID_company | 1,620,176 | 1,620,176 | 1,620,176 |
| Firm FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

7.2 Different levels of clustering

The technique of clustering standard errors is important for the statistical significance of estimated coefficients. In our main model we cluster the standard errors at the country level, as the unexplained components of firm leverage can strongly depend on business climate in a country. However, it may well be that standard errors are clustered more within a particular industry, or for a particular firm. Here we test whether clustering at the industry-level, country-industry level and firm-level matters for the statistical significance of our results.

Table 13 displays the standard errors for the different clustering techniques. In all cases, our main results are statistically significant. As clustering at the country level is done with the lowest number of clusters, one observes the largest standard errors in this case. The lowest standard errors are found when clustering at the firm-level.

Table 13: Levels of clustering

| VARIABLES | (1) Country | (2) Industry | (3) Firm |
|-----------------|----------------------|-----------------------|-----------------------|
| Insolvency law | 0.0037** (0.0017) | 0.0037*** (0.0006) | 0.0037*** (0.0001) |
| Constant | 0.0612 (0.0583) | 0.0612*** (0.0141) | 0.0620*** (0.0025) |
| Observations | 7,364,677 | 7,364,677 | 7,364,677 |
| R-squared | 0.0854 | 0.0854 | 0.0854 |
| Number of firms | 1,620,176 | 1,620,176 | 1,620,176 |
| Firm FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

7.3 Sample selection

In our sample we use data on all available EU member states. It is possible that our baseline results are affected by some specific countries, both in terms of the changes in insolvency law or long-term leverage patterns of firms. In order to investigate the impact of individual member states on our outcomes, we decided to run the baseline model whilst excluding individual countries.⁴² The results are robust to dropping all countries but Greece and Italy. After dropping

⁴²The results of this exercise are available on request.

these two countries from the sample, the coefficient on insolvency law changes is still positive and of a similar magnitude yet no longer statistically significant.

Exploring Greece in more detail shows that it is only one of the few countries in which insolvency law has been changed during the first phase of the financial crisis (2008/2009). As can be seen in figure 1, Greece’s index jumps from 4 to 10 in 2009, and to 11.5 in 2013. The same goes for Italy, for which insolvency law has actually been adjusted three times: from 9 to 11 in 2005, to 12 in 2008 and to 13.5 in 2014. Removing Greece and Italy from the sample thus involves the drop of quite some variation in insolvency law, compared to the total number of changes in our sample (see Table 14), especially during the financial crisis. This will lead to less explanatory power, and hence a drop in the significance of the effect of insolvency law on long-term leverage. Running the model from 2010 onward renders the coefficient for the effect of insolvency law on long-term leverage statistically significant for when Greece is dropped from the model. However, Italy’s variation is still needed in terms of explanatory power.

Table 14: Number of changes in insolvency law

| Country | No. changes | Country | No. changes |
|---------|-------------|---------|-------------|
| BE | 1 | GR | 2 |
| BG | 1 | HR | 2 |
| CY | 1 | IT | 3 |
| DK | 2 | LV | 2 |
| EE | 1 | PL | 2 |
| ES | 1 | PT | 1 |
| FI | 1 | RO | 1 |
| FR | 2 | SK | 1 |
| EU | 24 | | |

BE=Belgium, BG=Bulgaria, CY=Cyprus, DK=Denmark, EE=Estonia, ES=Spain, FI=Finland, FR=France, GR=Greece, HR=Croatia, IT=Italy, LV=Latvia, PL=Poland, PT=Portugal, RO=Romania, SK=Slovakia, EA=euro area average.

8 Conclusion

Insolvency law formalizes the positions of the debtors and creditors of financially stressed firms. Recently, the European Commission (EC) has taken steps towards harmonizing insolvency law across the European Union (EU), with the main aim strengthening capital markets and fostering diverse financing opportunities for firms, especially SME’s. This process towards harmonization can have a substantial impact on firm financing structure through effects on the supply and

demand for funding. In this paper we investigate the impact of changes in insolvency law in EU member states on firm capital structure. Furthermore, we explore whether demand- or supply-side mechanisms dominate concerning insolvency law adjustments.

We find that improving insolvency law increases long-term leverage. This result is robust to various alterations in the estimated model, different measures of leverage, clustering techniques and sample selections. We also find that the increase in long-term leverage is partly driven by a substitution away from short-term lending. The increase in long-term leverage is most pronounced for large firms with a lot of tangible assets. On top of that we find that the effect of insolvency law is decreasing in the length of procedures, which shows that the efficiency of insolvency procedure is also important aside from the law in the books.

Not only that, a main novelty of our paper is our investigation into whether demand or supply side mechanisms are more important in driving the relationship between insolvency law and firm capital structure. We do so by classifying changes in insolvency law as either debtor- or creditor-friendly. Our results provide support for the demand-side channel. Creditor friendly changes have a slightly negative, though not statistically significant, effect on long-term leverage. Second, and most importantly, we find that debtor-friendly changes in insolvency law has a positive, and for one of the components a statistically significant, effect on long-term leverage. Again, this supports the demand-side channel as a strengthening of the position of debtors during insolvency appears to lead to more demand for long-term debt.

The results of this paper have important policy implications. First, our results show that improvements in insolvency laws will result in longer debt maturities. This is a relevant result in terms of firm resilience. Longer maturity structures make firms less vulnerable to interest rate spikes and credit crunches. Second, the impact of harmonizing insolvency law in the EU can have quite some heterogeneous effects across member states. Most importantly, EU countries with lengthy bankruptcy procedures will be affected less by changes in insolvency law than countries in which procedures are fast. Lastly, our results show that the effect is strongest for large firms with a lot of tangible assets. This is unfortunate, it is mostly small, young firms without any assets that have liquidity problems and have difficulty attracting financing.

Unfortunately, we could not answer all relevant questions concerning the effect that changing insolvency law will have. Other relevant questions are: how changing or harmonizing insolvency law (i) affects cross-border financing, (ii) fosters more diverse providers of financing, and (iii) affects demand for and supply of secured and unsecured lending plays out. As we are, however, limited by the scope of the data, we leave these interesting matters to future research.

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