Bankruptcy Law and Firm Size*

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Abstract

Weaker creditor rights can increase credit costs and thus prompt firms to reduce debt and investment. Yet, they can reduce distress costs and thus allow firms to increase leverage and eliminate risk-reducing but unprofitable investments. We hypothesize that firm size influences the effect of creditor rights on credit costs and distress costs and thus which effect dominates. Weaker creditor rights should have a negative effect for small firms but a positive effect for large firms. Using a German bankruptcy reform, we find support for our hypothesis. Our findings reconcile mixed evidence and have important implications for optimal bankruptcy design.

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1. Introduction

What is the effect of creditor rights on corporate leverage and investments? Although there is a large literature on this question, the answer remains unclear. Weaker creditor rights can increase secured credit costs and thus restrict firms' access to debt and investment. Yet, they can also decrease distress costs and thus allow firms to increase default risk by increasing leverage and eliminating risk-reducing but unprofitable investments. The existing empirical evidence is mixed, which is puzzling given that whether the effect of creditor rights on credit costs or on distress costs dominates should ultimately be determined empirically.[1]

In this paper, we hypothesize that the effect of creditor rights depends on firm size. Specifically, we posit that firm size influences the effect of creditor rights on credit costs and distress costs and thus which effect dominates. Weaker creditor rights should have a positive effect for large firms but a negative effect for small firms. Intuitively, for large firms, the effect of weaker creditor rights on credit costs should be relatively negligible, as available information can substitute for lower collateral value and alternative sources of lending are available. At the same time, the effect on distress costs should be relatively important, as bankruptcy costs for management and shareholders are high due to high private benefits of control and high inefficient liquidation costs. In contrast, small firms should have relatively high costs and relatively low benefits.

Our hypothesis has several important implications. First, it can guide policymakers in ongoing legislative decisions. For example, it was recently proposed to implement a harmonized EU-wide debtor-friendly law for large firms. Second, it can explain the mixed evidence in the literature. A debtor-friendly law can cause a positive effect in samples with many large firms, but a negative effect in samples with many small firms. Third, it has implications for optimal bankruptcy law design. Contrary to a widely held view that bankruptcy law should be uniform and balance the level of creditor rights, it suggests a menu of procedures in which a creditor-friendly and debtor-friendly code coexist.

We begin by presenting preliminary evidence on our hypothesis based on the findings of existing studies. We show that virtually all studies that document a positive effect of lower creditor

[1] For studies that find a negative effect of weaker creditor rights, see, e.g., Campello and Larrain (2016), Ponticelli and Alencar (2016), Rodano, Serrano-Velarde, and Tarantino (2016), Calomiris et al. (2017), and Aretz, Campello, and Marchica (2020); and for studies that find a positive effect, see, e.g., Acharya and Subramanian (2009), Acharya, Amihud, and Litov (2011), Vig (2013), Cho et al. (2014), and Schoenherr and Starmans (2022).

rights are based on a sample of large firms. In contrast, virtually all studies that document a negative effect are based on a sample of small firms.

To provide more detailed evidence, we use Germany's bankruptcy law reform of 2012, which replaced a creditor-friendly law with a debtor-friendly law. In particular, the reform reduced creditor rights by introducing a debtor-in-possession proceeding (similar to U.S. Chapter 11) that allows management to stay in corporate control during the bankruptcy procedure and also imposes an automatic stay on the assets. The new law, therefore, reduced secured creditors' power to recover their collateralized claims, but also reduced distress costs for shareholders and management.

To measure the effect of the reform, we follow existing studies (e.g., Vig, 2013) and compare high asset tangibility firms with low asset tangibility firms around the reform. Specifically, we use the idea that high asset tangibility firms are more affected by a change in creditor rights, as higher levels of tangible assets make the trade-off between the effect that creditor rights have on distress costs and that on credit costs more important (i.e., whether to increase default risk due to lower distress costs or to reduce debt due to higher credit costs).

We start by studying the effect of the debtor-friendly reform for large firms. We find that high tangibility firms increased leverage (using both secured debt and unsecured debt) after the reform relative to low tangibility firms. Additionally, high tangibility firms relatively eliminated risk-reducing but unprofitable investments such as high recovery assets that can be sold to defer bankruptcy in situations of distress. Finally, high tangibility firms exhibited a relative increase in profitability. Taken together, these results are consistent with the hypothesis that a debtor-friendly law is beneficial for large firms in which distress costs dominate credit costs.

Next, we study the potentially different effects of lower creditor rights on leverage across different firm sizes. We find that the effect of creditor rights strongly depends on firm size. In particular, we find that the positive changes in leverage of high tangibility firms relative to low tangibility firms are strong among very large firms and decrease monotonically when moving to small firms.

Finally, we study the effect of weaker creditor rights for small firms. We find that high tangibility firms relatively reduced debt, and particularly secured debt for which weaker creditor rights increase credit costs. Additionally, we find that the restricted access to debt is related to a relative reduction in investments. Taken together, these results are consistent with the hypothesis that a debtor-friendly law is costly for small firms in which credit costs dominate distress costs.

A potential concern with our results is that a confounding shock affected high and low tangibility firms differently after the reform. However, in our analysis, a confounding factor would not only need to affect high and low tangibility firms differently but also affect differently large and small firms, which already reduces endogeneity concerns considerably. Three pieces of evidence further mitigate concerns. First, we find parallel trends of high and low tangibility firms prior to the reform, suggesting same trends without the reform. Second, we find similar effects when comparing high with low tangibility firms within the same industry, suggesting that potentially different industry shocks across high and low tangibility firms do not affect our results. Third, we redo our analysis by comparing risky firms and safe firms, using the fact that risky firms should be more affected by changes in bankruptcy law. We find similar results, suggesting that a confounding shock would additionally need to affect risky and safe firms differently.

Our paper makes three contributions. First, our finding that a debtor-friendly law has positive effects for large firms operating in a bank-based economy with established industrial firms such as Germany is particularly relevant in the light of ongoing policy discussions. Recently, it has been proposed to implement a harmonized EU-wide debtor-friendly law for large firms (Becker and Oehmke, 2025), and our finding supports this view. Existing evidence on the effect of creditor rights is notoriously mixed, and papers finding beneficial effects for large firms use cross-country data (Acharya and Subramanian, 2009; Acharya, Amihud, and Litov, 2011; Cho et al., 2014) or evidence from India (Vig, 2013) or South Korea (Schoenherr and Starmans, 2022).

Second, our finding that a debtor-friendly law can be beneficial for large firms but costly for small firms helps reconcile the conflicting evidence of existing studies on creditor rights. Weaker creditor rights can have a positive effect in samples or countries in which large firms dominate but can have a negative effect in samples or countries in which small firms dominate. Our review of the findings of existing studies together with the corresponding sample characteristics confirms this view. Importantly, firm size is not the only determinant in how firms ultimately respond to creditor rights. For example, Schoenherr and Starmans (2022) show that owners' and managers' personal costs of bankruptcy critically affect how firms react to creditor rights.

Third, our finding that the effect of creditor rights depends on the firm type has important implications for optimal bankruptcy design. Specifically, it is contrary to a widely held opinion that bankruptcy law should be uniform and balance the effect of creditor rights on credit costs and

distress costs.[2] Rather, it points to a menu of procedures in which a debtor-friendly and creditor-friendly procedure coexist and thus allow different types of firms to use the procedure that suits them best – e.g., a debtor-friendly law for large firms and a creditor-friendly law for small firms.[3] If such a menu is not feasible, our analysis suggests that countries should choose a debtor-friendly or creditor-friendly law depending on an important firm type in the country.[4] In this sense, our findings are in line with Becker and Oehmke (2025), who recently proposed an EU opt-in framework allowing large firms to opt into an EU-wide debtor-friendly procedure, while allowing small firms to stay in their national procedure.

The rest of the paper is organized as follows. Section 2 provides a theoretical framework. Section 3 describes Germany's bankruptcy reform. Section 4 describes the empirical strategy and the data. Section 5 presents the results. Section 6 concludes.

2. Theoretical framework and preliminary evidence

2.1 Theoretical framework

Lower creditor rights can increase the credit costs of secured debt, thereby restricting firms' debt financing and investment. However, they can also reduce distress costs, thereby allowing firms to take on more risk by increasing leverage and eliminating risk-reducing but unprofitable investments. We follow the idea that the effect of creditor rights should depend on the firm type (Rasmussen, 1992; Schwartz, 1997; Hart, 2000).[5] Specifically, we hypothesize that the effect

[2] For example, Acharya, Amihud, and Litov (2011, p. 165) write: "The optimal level of creditor rights should balance their positive effect on the supply of credit against their negative effect on corporate risk-taking and on operating performance, as well as on the demand for debt. In future work, it would be interesting to assess directly this important tradeoff."

[3] For the menu approach, see Rasmussen (1992), Schwartz (1997), and Hart (2000). For example, Hart (2000, p. 1) writes: "One point I will stress is that it is unlikely that "one size fits all." (. …) One can also imagine a country choosing a menu of procedures and allowing firms to select among them."

[4] The view that, for each firm type, one of the two effects of creditor rights should dominate actually leads to a practically feasible and effective solution: a menu with only two procedures–a creditor-friendly law that allows, e.g., SMEs to use the dominance of credit costs over distress costs, and a debtor-friendly law that allows, e.g., large firms to use the dominance of distress costs over credit costs. Concerns about a menu approach have generally focused on a menu within a firm type. For example, it has been argued that a firm borrows across different times with varying preferences over the precise formulation of the law, or that a firm has many creditors, making it difficult to apply different procedures across creditors (see Schwartz, 1997, who discusses possible concerns).

[5] Rasmussen (1992), Schwartz (1997), and Hart (2000) argue that diversity among firms implies that different firms might wish to be subject to different bankruptcy regimes. For example, Rasmussen (1992, p. 102) states: "A limited partnership whose sole asset is an apartment building, the construction of which is financed by a loan from a bank, might be the type of firm that would select the no-bankruptcy [creditor-friendly] option. (. …) Their sole concern is receiving the lowest interest rate possible. The lower the interest rate, the greater the likelihood that the owners of the building will be able to service the debt load and have profits left over."

depends on firm size, as firm size influences the effect that creditor rights have on credit costs and distress costs and thus which effect dominates.

For large firms, the effect of weaker creditor rights on secured credit costs should be relatively negligible, as available information (e.g., through long-lasting bank relations or comprehensive disclosure obligations) can substitute for lower collateral values (Djankov, McLiesh, and Shleifer, 2007; Qian and Strahan, 2007; Haselmann, Pistor, and Vig, 2010; Chaney, Sraer, and Thesmar, 2012; Vig, 2013; Campello and Larrain, 2016; Aretz, Campello, and Marchica, 2020).[6] Additionally, these firms typically have broader access to unsecured debt and public lending. In contrast, for small firms, the effect on credit costs should be relatively important, as they are typically opaque and rely heavily on bank-intermediated and secured lending. There is ample evidence supporting this view, for example, studies showing that small firms are inherently more financially constrained (e.g., Whited and Wu, 2006; Beck, Demirgüc-Kunt, and Maksimovic, 2008; Hadlock and Pierce, 2010; ECB, 2020), studies showing that the sensitivity of financing and investment to changes in collateral value is stronger for smaller firms (Qian and Strahan, 2007; Chaney, Sraer, and Thesmar, 2012), or studies showing that small firms rely more on collateralized lending (e.g., Qian and Strahan, 2007; Chodorow-Reich et al., 2022).

At the same time, for large firms, the effect of weaker creditor rights on distress costs should be relatively important, as bankruptcy costs for management and shareholders are high due to high private benefits of control, high inefficient liquidation costs (Becker and Oehmke, 2025), and undiversified human capital over time.[7] In contrast, for small firms, the effect on distress costs should be relatively less important, as they typically have low bankruptcy costs. Evidence comes from our bankruptcy data in Figure 2, which shows that the share of bankrupt firms applying for restructuring is 31% among large firms, decreasing with firm size, and 1% among very small firms (with the remainder applying voluntarily for liquidation). This aligns with evidence from Hotchkiss, Iverson, and Zheng (2025), who show that small firms are less likely to use Chapter 11; however, not because they face low bankruptcy costs, but because reorganization costs are prohibitively high.

[6] Taken together, the authors argue that the positive effect of increased collateral value may be stronger for certain firm types, such as small firms, for which collateral typically compensates for information problems.

[7] Becker and Oehmke (2025, p. 3) write: "For large firms with complex debt structures, multinational operations, many corporate subsidiaries and intangible assets, liquidation is typically an inefficient outcome."

Panel A of Figure 1 summarizes the benefits and costs of lower creditor rights across firm size. Specifically, the benefits of lower creditor rights increase with firm size, while the costs decrease with firm size. In other words, large firms have high benefits and low costs, whereas small firms have low benefits and high costs.

Panel B summarizes the total effect across firm size and the core predictions from our hypothesis:

> **Prediction 1.** For large firms, weaker creditor rights have a positive effect. Specifically, these firms increase distress risk by increasing leverage and eliminating risk-reducing but unprofitable investments.
>
> **Prediction 2.** The positive effect of weaker creditor rights should decrease as firm size decreases.
>
> **Prediction 3.** For small firms, weaker creditor rights have a negative effect. Specifically, these firms decrease debt, and particularly secured debt for which weaker creditor rights increase credit costs. Additionally, the resulting increased financial constraints lead to a reduction in investments.

Before proceeding, we note an important point. Our theory and empirical data are based on small firms with the legal form of limited liability and thus should not have substantial personal bankruptcy costs. Small firms with full liability, such as sole proprietorships or start-ups, may have high bankruptcy costs and can therefore behave more like large firms (although experiencing larger changes in credit costs than large firms).[8]

2.2 Preliminary evidence

Before conducting a more detailed empirical analysis, we present preliminary evidence for our hypothesis based on the findings of existing studies. Table 1 presents an overview of some major empirical bankruptcy studies. For each paper, the table shows the documented effect of a reduction in creditor rights as well as the average firm size of the sample used.

All studies based on a sample of large firms find a positive effect of weaker creditor rights. In contrast, papers based on a sample of small firms find a negative effect. The results are consistent

[8] For example, Armour and Cumming (2008) show that more forgiving personal bankruptcy laws have positive effects on entrepreneurship.

with our hypothesis that weaker creditor rights are beneficial for large firms and costly for small firms.

3. Germany's bankruptcy law reform of 2012

3.1 Pre-reform bankruptcy law

The pre-reform bankruptcy law in Germany was characterized by strong creditor rights. The law allowed secured creditors to recover their collateralized claims but imposed severe distress costs on shareholders and management. In particular, management was dismissed immediately after submitting the bankruptcy petition, and corporate control was transferred to an insolvency administrator. The administrator's task was to continue the firm until the voting date (when different classes of claimants should vote on firm continuation or liquidation), typically scheduled six months after submission. However, the administrator's overriding objective of protecting creditors from adverse changes in asset values (i.e., liquidating the firm if a threat to asset values was recognized), together with the threat of contingent liabilities to creditors if this objective was violated, essentially gave secured creditors the power to seize their collateralized assets during bankruptcy, which in turn led to automatic firm liquidation.

Empirically, 86% of firms in bankruptcy were liquidated by the insolvency administrator before the voting date (55% were liquidated within the first three months of the procedure). Overall, while secured creditors could have expected a recovery rate of more than 70% of their collateralized claims, bankrupt firms underwent liquidation at the end of the bankruptcy procedure in about 89% of cases.[9,10]

3.2 The ESUG Act

As a response to the economic consequences of the 2007–2009 financial crisis (and to compete with international reorganization jurisdictions; see below), Germany reformed its bankruptcy law by introducing the Act for Further Facilitation of the Restructuring of Companies (ESUG Act

[9] On the pre-reform and post-reform laws, see the German bankruptcy law and the ESUG bill (Gesetzentwurf der Bundesregierung: Entwurf eines Gesetzes zur weiteren Erleichterung der Sanierung von Unternehmen, available here). On the pre-reform data, see Icks and Kranzusch (2009, 2010), who study bankruptcy cases from 2002 to 2008.

[10] Under the new law, on the voting date, the law provided a cram down option that allowed the court to impose a restructuring plan on dissenting groups if the majority of claimant groups confirmed the plan. However, because major decisions were already made by the insolvency administrator before the voting date, this possibility was rarely used.

henceforth) in 2012. The main objective of the reform was to facilitate the restructuring of distressed firms, and to achieve this objective, several provisions similar to U.S. Chapter 11 provisions were adopted. In particular, the ESUG Act introduced a debtor-in-possession proceeding lasting about six months (i.e., until the voting date), which allows management to stay in unrestricted corporate control during the bankruptcy procedure.[11,12] Additionally, the proceeding imposes an automatic stay on the assets, which prevents secured creditors from seizing their assets and thereby protects debtors from automatic liquidation. Importantly, management can enter the reorganization procedure unilaterally, meaning there are no strict restrictions, such as creditors' consent, when management files for the debtor-in-possession procedure (the only conditions are that the reorganization procedure is not obviously unfeasible and that the firm's assets are sufficient to cover legal costs). Finally, to ensure a path to firm continuation as the outcome, the law furthermore provides a cram down option that allows the court to impose a restructuring plan on dissenting groups if the majority of claimant groups confirms the plan.[13]

By introducing a debtor-in-possession proceeding, the ESUG Act fundamentally reduced secured creditors' power to recover their collateralized claims while reducing distress costs for shareholders and management. To get a better understanding of the strength of the changes introduced by the ESUG Act, it is useful to consider the well-known creditor rights index by La Porta et al. (1998), which captures the power of secured creditors against the debtor in bankruptcy. The index ranges between four (strong creditor rights or weak debtor rights) and zero (weak creditor rights or strong debtor rights), and is formed by adding one when (i) the reorganization

[11] As U.S. Chapter 11, upon filing, a trustee is appointed who has the task to help management and to inform creditors of ongoing developments in the process. The trustee has no control or liquidation rights.

[12] Theoretically, after three months, creditors can ask the court to terminate the debtor-in-possession proceeding. However, this is only possible if concrete circumstances can be proved—with any uncertainty or ambiguity going to the expense of the complaining party—that would result in substantial disadvantages for all claimant groups. Based on anecdotal evidence, the debtor-in-possession proceeding was terminated only in exceptional cases, either because creditors were able to prove such circumstances or because firms voluntarily initiated a firm liquidation. Additionally, as shown in Panel D of Figure 2, almost 90% of firms that filed for ESUG reorganization experienced continuation as the outcome of the bankruptcy procedure, empirically documenting the effectiveness of the law in protecting debtors against liquidation attempts of creditors.

[13] We restrict our discussion of the changes introduced by the ESUG Act to the debtor-in-possession proceeding. The reform introduced several other restructuring-friendly mechanisms, such as the possibility of a debt-equity swap, adding the group of equity holders to the classes of claimants (thereby increasing the voting power of groups typically interested in firm continuation), and the possibility of an umbrella proceeding for firms that are not yet in payment default but want to use helpful features of the German bankruptcy law. It is also noteworthy that the new law activated helpful features of the German bankruptcy law that already existed before the reform but could not be used by the management as it was dismissed during bankruptcy, such as the possibility to terminate contracts with unfavorable terms, a payment hold on existing liabilities, and a payment hold on salaries that are continued to be paid by the German social security system.

procedure does not impose an automatic stay on the assets of the firm, i.e., secured creditors are able to seize their assets after the reorganization petition is approved; (ii) the reorganization procedure imposes restrictions, such as secured creditors' consent, for a debtor to file for it; (iii) secured creditors are ranked first in the distribution of the proceeds that result from the disposition of the assets of a bankrupt firm; and (iv) an administrator is appointed for running the firm in bankruptcy, i.e., management is dismissed during bankruptcy. As such, ESUG reduced Germany's creditor rights index from a score of four to a score of one (i.e., only the secured creditors' right to be paid first is left unchanged) and therefore effectively replaced a creditor-friendly law with a debtor-friendly one.

There is ample anecdotal evidence on the empirical relevance of the changes introduced by the ESUG Act.[14] Surveys and interviews with crucial market participants consistently suggest that the new law marks the beginning of a new restructuring culture in Germany, thereby ending decades of a bankruptcy regime hallmarked by liquidation. Moreover, it is commonly concluded that the main goals of the bankruptcy law reform were achieved. Specifically, the debtor-in-possession proceeding is easily accessible, a firm restructuring is facilitated, and the course of the bankruptcy procedure has become more predictable (by avoiding the arbitrary decisions of the insolvency administrator).

In Figure 2, we present empirical evidence related to ESUG. Panel A shows the filing rate of bankrupt firms for a reorganization procedure under ESUG, separately for all bankrupt firms and for the 50 largest annual bankruptcy cases. For 2017, while the filing rate for an ESUG reorganization is not more than 3% among all bankrupt firms (i.e., 97% voluntarily filed for a liquidation procedure under an insolvency administrator), it is 62% among the 50 largest bankrupt firms. Panel B further details the share of bankrupt firms that used a firm restructuring under ESUG for different firm sizes. As shown, while the share was less than 1% among small firms, it increased monotonically in firm size, and was 31% among large firms. These data are consistent with our hypothesis that the effect that creditor rights have on distress costs should be more important for large firms.

Panel C documents the acceptance rate when a firm files for ESUG reorganization. As can be seen, in 2017, about 90% of firms that filed for ESUG reorganization received approval to do so,

[14] For surveys based on standardized questions or interviews with relevant market participants such as managers, creditors, judges, or consultants, see the Credit reform survey (2014), the Boston Consulting Group study (2018), and the ESUG evaluation report (2018) commissioned by the German government.

empirically reflecting that there are no strict restrictions, such as creditors' consent, for a debtor to enter the reorganization procedure. Finally, Panel D shows the continuation rate (either in the form of an accepted reorganization plan or an asset deal) of firms that filed for an ESUG procedure.[15] As shown, almost 90% of firms that filed for ESUG experienced a firm continuation as the outcome of the bankruptcy procedure, which empirically documents the effectiveness of the new law in preventing secured creditors from seizing their collateralized assets and cramming down dissenting groups on the voting date.

3.3 History of the bankruptcy reform

It might be helpful to briefly outline the history of the reform. Pressed by the need to compete with other reorganization laws that have been increasingly favored by investors in their investment decisions, German political parties agreed to modernize Germany's bankruptcy law in the coalition agreement of 2009. However, ultimately no major changes were made until June 2010, when an opposition party put forward a letter of request demanding that the government immediately implement a restructuring law, on the grounds that the full extent of the economic consequences of the 2007–2009 financial crisis had become apparent and that, under the existing law, many distressed but viable firms were likely to be inefficiently liquidated. Following this, in September 2010, German Parliament presented a discussion paper on ESUG (which formed the basis for the first ESUG draft in February 2011), in which specific amendments were proposed for the first time. After several rounds of modifications and votes on the reform, the government passed ESUG in December 2011 and set its effective date for March 2012.[16]

There are two notable features of the ESUG Act from the empirical analysis standpoint. First, the bankruptcy law reform represents a reasonably exogenous shock to creditor rights, given that the reason for the reform—the 2007–2009 financial crisis or competition considerations—should not be related to firms' financial and investment policies or at least not differently across firms with

[15] It should be noted that the continuation rates of ESUG procedures are primarily intended to empirically confirm the effectiveness of the new law in preventing automatic firm liquidation by reducing secured creditors' power to seize the assets and not to compare changes in continuation rates with the pre-reform law. In particular, while the continuation rates of ESUG procedures include only firms that seek firm reorganization and thus exclude firms that voluntarily apply for liquidation, the above presented liquidation rates of the pre-reform law include such firms, which might naturally lead to higher liquidation rates.

[16] The request of the opposition party (Antrag der Fraktion BÜNDNIS 90/DIE GRÜNEN: Insolvenzrechtsreform unverzüglich vorlegen – Außergerichtliche Sanierungsverfahren stärken – Insolvenzplanverfahren attraktiver gestalten) is available here.

high and low asset tangibility (which constitute our treated and control groups; see below). Second, given that the introduction of the law was prompted by the financial crisis, the reform progressed swiftly, which arguably rules out major adjustments of firms and creditors in anticipation of the legal changes before the reform was formally passed in December 2011.

4. Empirical strategy and data

4.1 Empirical strategy

To measure the effect of the reform, we follow Vig (2013) by comparing high asset tangibility firms and low asset tangibility firms around the reform. In doing so, we use that high asset tangibility firms should be more affected by a change in creditor rights since higher levels of tangible assets make the trade-off between the effect that creditor rights have on distress costs and that on credit costs more important—i.e., whether to increase default risk as a result of lower distress costs or to reduce debt as a result of higher credit costs.[17]

Specifically, we divide our sample into three terciles based on firms' average pre-reform (2009 to 2011) measure of asset tangibility (fixed assets over total assets), and define firms in the highest tercile as our treated group and firms in the lowest tercile as our control group (excluding firms in the middle). We test the effect of the bankruptcy reform with the following difference-in-differences regression:

$$y_{it} = \alpha_i + \lambda_t + \eta Post_t + \gamma Treated_i + \delta(Post_t \, x \, Treated_i) + \varepsilon_{it}, \quad (1)$$

where i indexes firms, and t indexes time; y_{it} is one of our dependent variables of interest; α_i are firm fixed effects that control for time-invariant differences between firms; λ_t are year fixed effects that control for time-varying factors that are common to all firms; $Post_t$ is a dummy variable that

[17] To illustrate the effects of the reform, we compare two cases. Firm A has no tangible assets. Before ESUG, the firm held 10% unsecured debt. In bankruptcy, the firm had no distress costs (i.e., there was no liquidation bias from creditors and no fire sale of tangible assets). Post ESUG, the firm's debt structure and distress costs profile did not change. Firm B has 100% tangible assets. Before ESUG, the firm held 30% secured debt and 10% unsecured debt. In bankruptcy, the firm faced high distress costs (i.e., liquidation bias from creditors and potential fire sale of tangible assets). After ESUG, the firm has lower distress costs, and higher credit costs. The firm may increase default risk by more leverage (secured and unsecured) and riskier investments. Alternatively, the firm may reduce debt, and in particular secured debt, by higher credit costs of secured debt. Notably, before ESUG, high tangibility firms had high distress costs even without secured debt, given that also unsecured creditors may push for liquidation and cause a fire sale of tangible assets.

equals one for the years after the ESUG Act was passed (2012 to 2015), and zero for the years before the bankruptcy law reform was passed (2009 to 2011); $Treated_i$ is an indicator variable that equals one if the firm belongs to the treated group (top 33% firms), and zero if it belongs to the control group (bottom 33% firms); ε_{it} is the firm specific error term; and δ is the coefficient of interest which measures the difference-in-differences effect. We cluster standard errors at the firm level.

To mitigate the concern of confounding shocks that affected high and low asset tangibility firms differently after the reform, we present additional results in which we compare high tangibility firms and low tangibility firms within the same industry. To do so, we expand the baseline specification in equation (1) with the interaction term $\omega_j \, x \, \lambda_t$ (where j indexes industries; and ω_j are industry fixed effects), which effectively compares firms within the same industry by absorbing time-varying industry shocks. We measure this specification based on the two-digit SIC code.

Finally, we present additional results in which we control for $Log(Assets)_{it}$. We do not use controls in our main specification or add additional controls, as doing so introduces the problem of "bad controls" in our setting. More specifically, given that bankruptcy law design can affect many variables (e.g., leverage, investment, profitability, risk, etc.), adding such variables as controls may mechanically absorb existing effects. However, in unreported results, we employ standard controls, such as profitability and asset tangibility, and find similar effects.

4.2 Data

We rely on data from the Bureau van Dijk database. The data include public as well as private firms, which allows us to measure the effect of the reform for different firm sizes. Additionally, the database is unique in providing secured debt information, which is important to understand how bankruptcy law affects the use of collateral and secured debt.

We begin the sample construction by excluding sole proprietorships and micro firms (annual sales below 2 million euros), as these firms are typically not subject to mandatory disclosure requirements. Additionally, we exclude firms from the financial industries (SIC codes 6000–6999). Further, we drop firm-years with missing or negative values for sales and assets, and firm-years without complete data on the dependent and control variables. Additionally, we exclude firms without data on pre-reform asset tangibility. Finally, we require each firm to have at least two observations within the sample period, to accommodate the estimation of firm fixed effects. For

the sample period 2009–2015, the sample consists of 5,206 firms, or 3,462 firms when considering only high and low tangibility firms.

Two points are worth noting. First, the exclusion of sole proprietorships and micro firms tilts the full sample towards large firms. As such, our findings on the full sample can be interpreted as findings for large firms. Second, the exclusion of micro firms restricts our sample. As such, even if we look at small firms within our sample, we do not capture very small firms. Some papers in the literature find negative effects of lower creditor rights based on a sample of micro sized firms (see Table 1).

Table 2 presents summary statistics. Columns 1 to 4 report statistics for high and low tangibility firms in the full sample. Columns 5 to 8 report statistics for high and low tangibility firms for a subsample of small firms, which we use in Section 5.3. Specifically, we divide the initial sample into sextiles based on pre-reform asset size and use the lowest sextile as small firms. Most importantly, the summary statistics show that average asset size is 80.4 million euros for our full sample, and 5.5 million euros for our small firms.

5. Findings

5.1 Full sample – large firms

We start by examining the effects of lower creditor rights for our full sample, i.e., for large firms. Specifically, we test our Prediction 1 from Section 2, that is, we expect that large firms increase distress risk by increasing leverage and reducing risk-reducing but unprofitable assets.

Panel A of Figure 3 shows corporate leverage for high and low tangibility firms. As shown, high tangibility firms increased leverage after the ESUG Act relative to low tangibility firms. Note that the parallel trends of high and low tangibility firms before the reform suggest similar trends without the reform, thereby mitigating potential concerns of confounding shocks that affected high and low tangibility firms differently after the reform.

Columns 1 and 2 (with controls and industry-time fixed effects) of Table 3 show the difference-in-differences estimates for corporate leverage. As shown, the coefficient on $Post_t \; x \; Treated_i$ is positive and statistically significant, i.e., high tangibility firms relatively increased leverage after the reform.

In columns 3 and 4, we additionally examine whether firms used secured and/or unsecured debt to increase leverage by showing the results for the secured debt to capital ratio. Despite the low

credit costs of secured debt in a creditor-friendly environment, firms may have avoided their use to reduce default risk. Likewise, firms may have avoided unsecured debt to reduce default risk. As shown, there is no change in the ratio, suggesting that firms increased both secured and unsecured debt.

Panel B shows our results for investments. We proxy for risk-reducing but unprofitable investments using the fixed assets to assets ratio, given that high recovery assets can allow firms to defer bankruptcy in situations of distress by liquidating these assets and paying upcoming debt obligations (Acharya, Amihud, and Litov, 2011). As shown, high tangibility firms became relatively less able to defer bankruptcy in distress. Columns 5 and 6 confirm the findings.

In Panel C, we additionally show results on profitability. If the changes in investments are due to firms eliminating risk-reducing but unprofitable assets, we should observe an increase in profitability. As can be seen, high tangibility firms exhibited a relative increase in profitability. Columns 7 and 8 confirm this finding.

Taken together, these results are consistent with the hypothesis that a debtor-friendly law is beneficial for large firms in which distress costs dominate credit costs.

5.2 Heterogeneity across firm size

Next, we study potentially different effects of lower creditor rights on corporate leverage across different firm sizes. Based on our Prediction 2 in Section 2, we expect that the positive effect of ESUG should decrease when moving to smaller firms. To test this hypothesis, we first divide our initial sample (5,206 firms) into sextiles based on firm's average pre-reform (2009 to 2011) asset size. Within each sextile, we then again separate firms based on asset tangibility and compare high tangibility firms (i.e., the highest tercile) with low tangibility firms (i.e., the lowest tercile).

Figure 4 shows the difference-in-differences estimates together with the corresponding 90% confidence intervals for each of the sextiles. As can be seen, the effect of lower creditor rights strongly depends on firm size. Specifically, the positive change for high tangibility firms relative to low tangibility firms is high and statistically significant among large firms (the highest sextile), decreases almost monotonically when moving to smaller firms, and becomes absent (and slightly negative) for small firms.

Notably, the monotonic decrease is consistent with Panel B of Figure 1. Additionally, it is consistent with Panel B of Figure 2, which shows that the share of bankrupt firms applying for restructuring (as a proxy for distress costs) decreases monotonically with firm size.

5.3 Small firms

Finally, we study the effect of lower creditor rights for small firms, that is, we test Prediction 3 of Section 2. Specifically, we expect that small firms reduce debt financing, particularly secured debt financing. Additionally, we expect that the potentially increased financial constraints lead to lower investment growth. We test this hypothesis using the sample of small firms in the lowest sextile of Figure 4.

Panel A of Figure 5 shows corporate leverage for high tangibility firms and low tangibility firms. As shown, high tangibility firms appear to relatively decrease leverage after the reform (in contrast to the findings for large firms, where high tangibility firms relatively increased leverage). However, columns 1 and 2 of Table 4 show that the reduction in leverage is statistically insignificant.

For small firms, a reduction in creditor rights should increase the credit costs of secured debt and should therefore particularly restrict secured debt financing. Panel B shows the secured debt to capital ratio for high and low tangibility firms. As shown, high tangibility firms decreased secured debt relative to low tangibility firms after the reform. Columns 3 and 4 confirm this finding.

Panel C shows investments for high and low tangibility firms. We proxy for investments using the capex to assets ratio. As can be seen, high tangibility firms relatively decreased investments after the reform. Columns 5 and 6 support the results.

In columns 7 and 8, we additionally present results for profitability. In contrast to large firms, which may have reduced certain investments to increase profitability (and not because of financial constraints), small firms may have reduced potentially profitable investments because of financial constraints. As such, we should not observe an increase in profitability, but rather expect no changes in profitability (profitable investments typically generate returns only after some time, which is why we do not expect a reduction in profits). The results are consistent with this interpretation.

Taken together, these results are in line with the hypothesis that a debtor-friendly law is costly for small firms in which credit costs dominate distress costs.

5.4 Robustness: risky firms and safe firms

A potential concern with our results is that a confounding shock that is unrelated to the ESUG reform might have affected high and low tangibility firms differently after the reform. However, in our analysis, a confounding factor would not only need to affect high and low tangibility firms differently but also do so for large and small firms, which significantly reduces endogeneity concerns (i.e., a shock would need to positively affect large high tangibility firms relative to large low tangibility firms and negatively affect small high tangibility firms relative to small low tangibility firms). Additionally, the parallel trends between high and low tangibility firms prior to the reform, along with the similar results when comparing high and low tangibility firms within the same industry, further mitigate concerns.

In this section, we further mitigate concerns by redoing our analysis and comparing risky firms and safe firms. In doing so, we exploit the fact that risky firms should be more affected by bankruptcy law design, which is a commonly used method in identifying the effects of changes in bankruptcy law (e.g., Becker and Josephson, 2016; Rodano, Serrano-Velarde, and Tarantino, 2016; Schoenherr and Starmans, 2022). If we obtain results similar to our main analysis, confounding shocks would additionally need to affect risky and safe firms differently.

We measure bankruptcy risk using the interest coverage ratio, which is defined as EBIT divided by interest payments. As before, we divide our initial sample into three terciles based on firms' average pre-reform (2009 to 2011) measure of bankruptcy risk. Firms in the lowest tercile (high risk) are our treated group and firms in the highest tercile (low risk) are our control group (excluding firms in the middle).

Columns 1 to 3 of Table 5 show the results for our full sample. The results indicate that risky firms relatively increased leverage, reduced high recovery assets, and exhibited higher levels of profitability (again consistent with Prediction 1).

Columns 4 to 6 show the results for small firms. Specifically, we again use the lowest sextile of our initial sample, and compare risky firms (lowest tercile) and safe firms (highest tercile) within this subsample. As shown in column 4, risky firms did not relatively increase leverage (again consistent with Prediction 2).

Columns 5 and 6 show that risky firms did not relatively decrease secured debt and investments, which deviates from our findings when comparing small high tangibility firms to small low tangibility firms. However, a likely reason is that increased secured credit costs are mainly relevant

to firms with high asset tangibility, and that risky firms have too few collateralizable assets (or that, for small firms, banks require collateral regardless of their riskiness). In this sense, it seems difficult to test the credit costs channel by comparing risky firms and safe firms.

6. Conclusions

Weaker creditor rights can increase credit costs and thus restrict firms' access to debt financing and investments. Yet, they can also lead to a decrease in distress costs and thus allow firms to increase default risk by increasing leverage and eliminating risk-reducing but unprofitable investments. In this paper, we argue that the overall effect of creditor rights depends on firm size, as firm size influences the effect that creditor rights have on credit costs and distress costs and thus which effect dominates. Specifically, we argue that weaker creditor rights have a positive effect for large firms and a negative effect for small firms. Using a German bankruptcy reform, we find support for this hypothesis.

Our findings have three important implications. First, they can help policymakers in ongoing legislative decisions. A recent proposal is to implement a harmonized EU-wide debtor friendly law for large firms. Our findings support such a proposal. Second, they can explain the mixed evidence in the bankruptcy literature. A debtor-friendly law can have a positive effect in a sample consisting of large firms, but a negative effect in a sample consisting of small firms. An examination of the findings of existing studies together with the corresponding sample characteristics confirms this view.

Finally, our findings have implications for optimal bankruptcy design. Specifically, they point to a menu of procedures in which a debtor-friendly and creditor-friendly procedure coexist and thus allow different firm types to use the procedure that suits them best. If such a menu is not possible, our analysis suggests that countries could choose between a debtor-friendly or creditor-friendly law depending on an important firm type in the country. Our findings, therefore, support recent policy proposals for an EU opt-in approach, which allows large firms to opt into an EU-wide debtor-friendly procedure while allowing small firms to stay in their national procedure.

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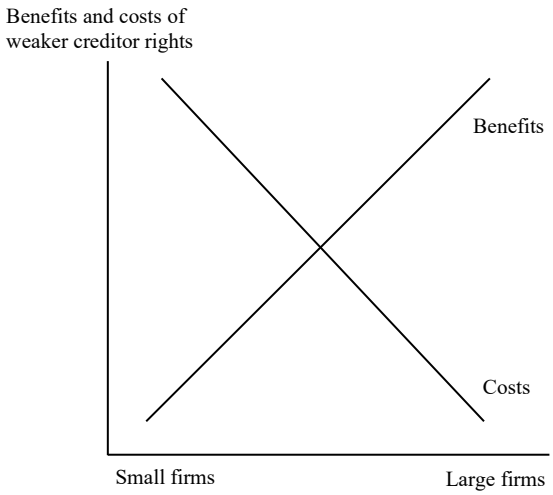
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Figures and tables

Panel A. Benefits and costs of weaker creditor rights



Panel B. Total effect of weaker creditor rights

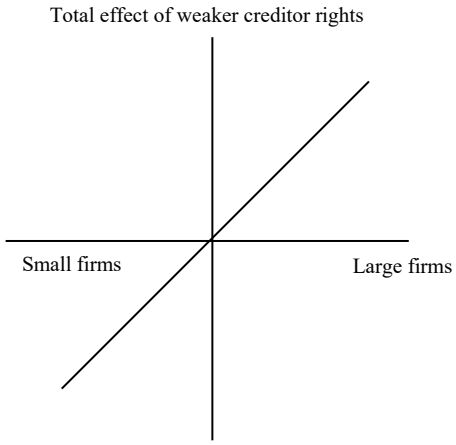


Figure 1
Theoretical framework

Panel A shows the benefits and costs of weaker creditor rights across firm size. Panel B shows the total effect of weaker creditor rights across firm size.

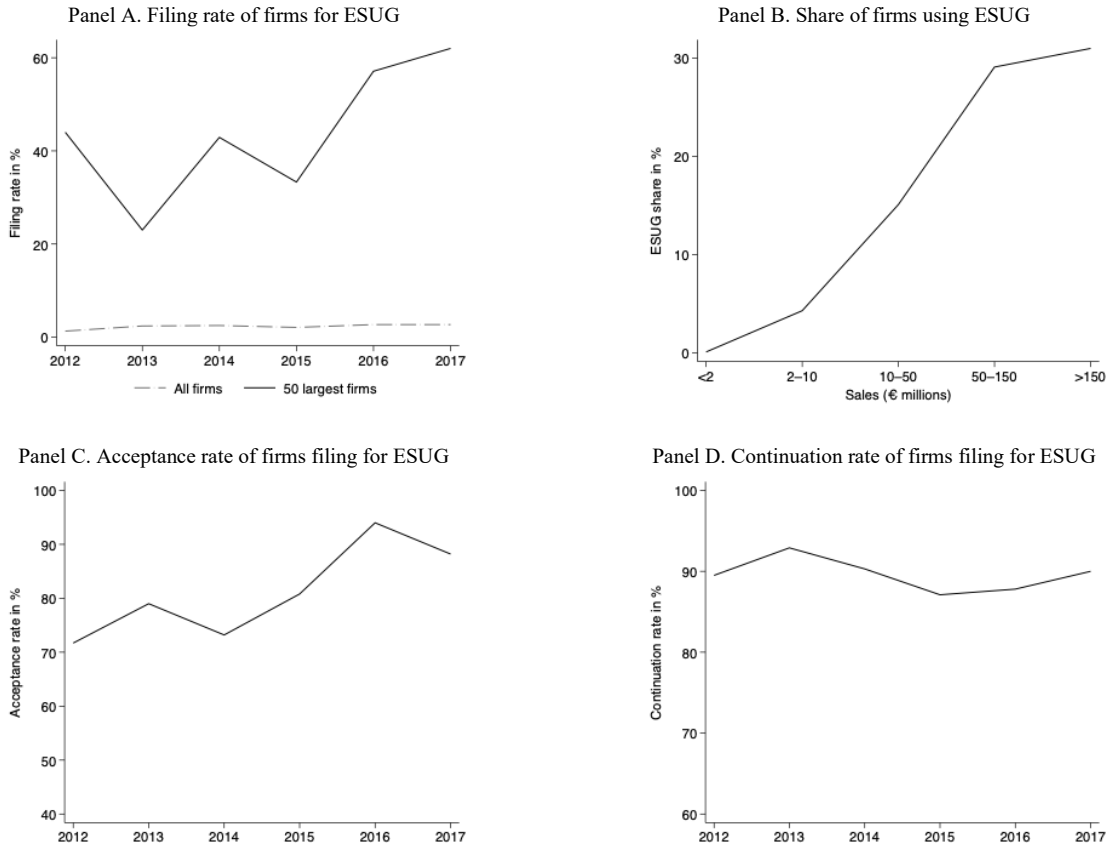


Figure 2
Data on the ESUG Act

Panel A shows the filing rate of bankrupt firms for ESUG restructuring for all bankrupt firms and for the 50 largest bankrupt firms (measured by sales). Panel B shows the share of bankrupt firms using ESUG restructuring for different firm sizes. Panel C shows the acceptance rate of bankrupt firms filing for ESUG restructuring. Panel D shows the continuation rate of bankrupt firms filing for ESUG restructuring. The data come from JUVE legal information, The Boston Consulting Group, Finance-Magazin / Falkensteg, and ESUG evaluation report.

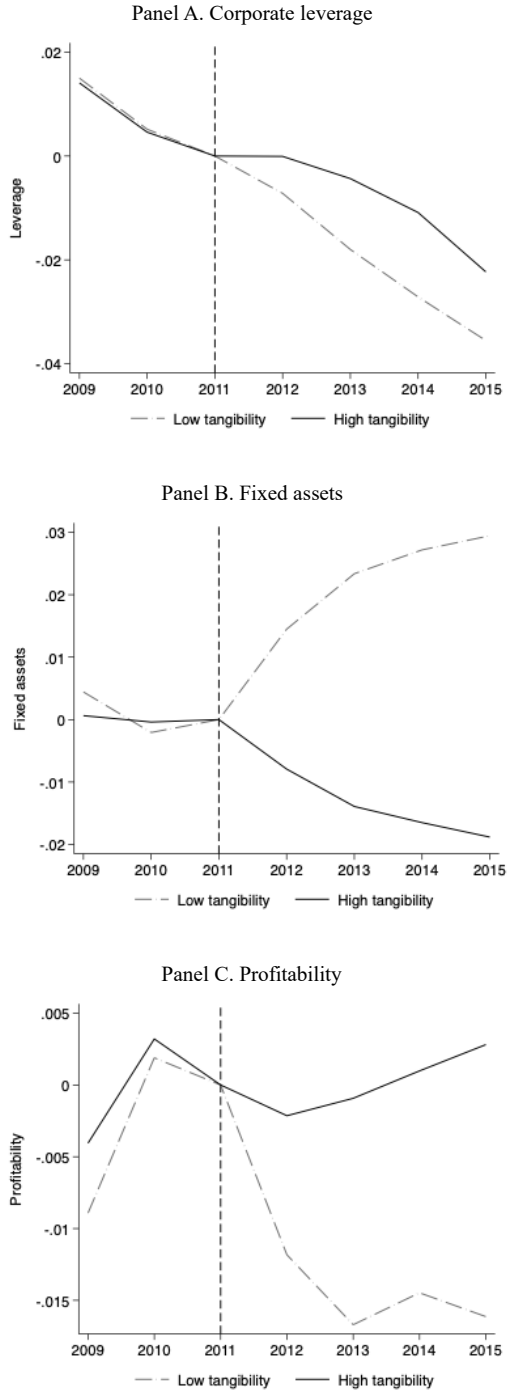


Figure 3
Bankruptcy reform in Germany and corporate leverage and investments for large firms

Panels A, B, and C respectively plot average corporate leverage, fixed assets, and profitability for high and low tangibility firms. The time series are normalized to zero relative to the year prior to the German bankruptcy reform, 2011. Refer to Table 2 for variable definitions.

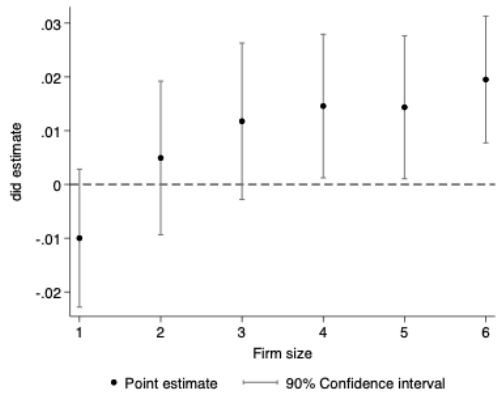


Figure 4
Bankruptcy reform in Germany and corporate leverage for different firm sizes

This figure plots the point estimates (black dots) and 90% confidence intervals on the interaction terms between Treated and Post for samples with different firm sizes. The regression is specified as in column 1 of Table 3, that is, with firm fixed effects, year fixed effects, and standard errors clustered on the firm level. Refer to Table 2 for variable definitions.

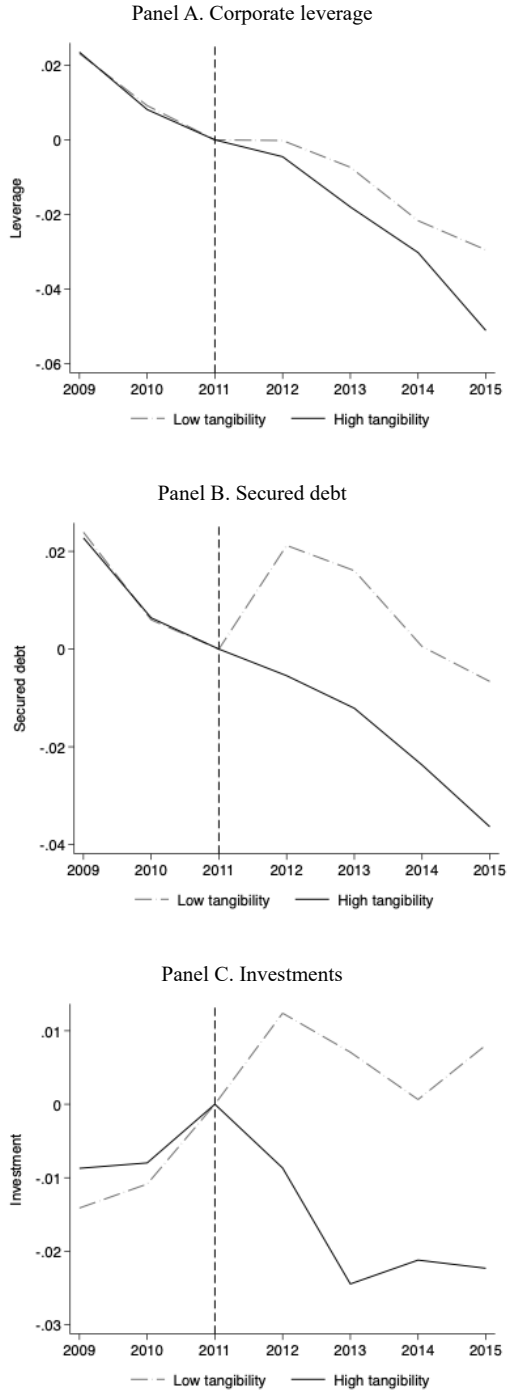


Figure 5
Bankruptcy reform in Germany and corporate leverage and investments for small firms

Panels A, B, and C respectively plot average corporate leverage, secured debt, and investments for high and low tangibility firms. The time series are normalized to zero relative to the year prior to the German bankruptcy reform, 2011. Refer to Table 2 for variable definitions.

Table 1

Empirical bankruptcy literature

This table presents an overview of the empirical bankruptcy literature. The columns show: column 1, documented effect of weaker creditor rights; and column 2, average firm size in the sample. Firm size is classified as small if average assets or sales are below $/€20 million or if the authors indicate that the sample consists of SMEs. Firm size is classified as large if average assets or sales exceed $/€20 million, if the authors indicate that the sample consists of large firms, or if the sample is based on listed firms.

	Effect of weaker creditor rights (1)	Average firm size (2)
Campello and Larrain (2016)	Negative	Small
Ponticelli and Alencar (2016)	Negative	Small
Rodano, Serrano-Velarde, and Tarantino (2016)	Negative	Small
Calomiris et al. (2017)	Negative	Small
Aretz, Campello, and Marchica (2020)	Negative	Small
Acharya and Subramanian (2009)	Positive	Large
Acharya, Amihud, and Litov (2011)	Positive	Large
Vig (2013)	Positive	Large
Cho et al. (2014)	Positive	Large
Schoenherr and Starmans (2022)	Positive	Large
Our study	Positive	Large

Table 2
Summary statistics

This table presents summary statistics for the full sample (columns 1–4) and for a sample of small firms (columns 5–8). The columns show: columns 1 and 5, mean; columns 2 and 6, standard deviation; columns 3 and 7, minimum; columns 4 and 8, maximum. The variables are defined as follows: leverage is the ratio of debt (short-term debt plus long-term debt) to capital (debt plus equity); secured debt is the ratio of secured debt to capital; profitability is the ratio of EBITDA to assets; fixed assets is the ratio of fixed assets to assets; investments is the ratio of capital expenditures to assets; and size is the logarithm of assets in thousands of euros.

	Full sample				Small firms			
	Mean	SD	Min	Max	Mean	SD	Min	Max
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Leverage	0.655	0.209	0.149	1.00	0.696	0.209	0.163	1.00
Secured debt	0.231	0.197	0.001	0.813	0.245	0.183	0.003	0.757
Fixed Assets	0.474	0.294	0.007	0.961	0.373	0.266	0.005	0.914
Profitability	0.110	0.090	-0.141	0.435	0.134	0.101	-0.164	0.461
Investments	0.059	0.069	-0.100	0.353	0.070	0.087	-0.075	0.422
Size	10.33	1.33	7.39	13.99	8.50	0.535	6.82	9.50
Assets (€ millions)	80.41	167.49	1.62	1,193	5.52	2.45	0.913	13.22
Sales (€ millions)	100.82	230.20	2.93	1,759	14.05	11.10	2.33	67.32

Table 3

Bankruptcy reform in Germany and corporate leverage and investments for the full sample

This table presents estimates of difference-in-differences regressions for the bankruptcy reform in Germany. The dependent variable is corporate leverage in columns 1 and 2, secured debt in columns 3 and 4, fixed assets in columns 5 and 6, and profitability in columns 7 and 8. Treated is a dummy variable that equals one if the firm has high tangibility (highest tercile), and zero if it has low tangibility (lowest tercile). Post is a dummy variable that equals one for the years after the bankruptcy reform was passed (2012 to 2015), and zero for the years before the reform was passed (2009 to 2011). *t*-values are reported in parentheses and are based on standard errors clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Refer to Table 2 for variable definitions.

	Leverage		Secured debt		Fixed assets		Profitability	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post x Treated	0.013***	0.012***	-0.003	-0.005	-0.035***	-0.048***	0.010***	0.006**
	(3.76)	(2.85)	(-0.72)	(-0.94)	(-12.45)	(-12.07)	(5.31)	(2.20)
Post	-0.051***	-0.081***	-0.026***	-0.046***	0.020***	0.017**	-0.003	-0.017*
	(-14.56)	(-6.46)	(-6.73)	(-3.72)	(6.95)	(1.98)	(-1.32)	(-1.91)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Industry X year	No	Yes	No	Yes	No	Yes	No	Yes
Observations	21,791	21,791	15,976	15,976	22,137	22,137	22,084	22,084
Number of firms	3,462	3,462	3,462	3,462	3,462	3,462	3,462	3,462
R^2 (within)	0.039	0.069	0.014	0.030	0.024	0.047	0.009	0.025

Table 4

Bankruptcy reform in Germany and corporate leverage and investments for small firms

This table presents estimates of difference-in-differences regressions for the bankruptcy reform in Germany. The dependent variable is corporate leverage in columns 1 and 2, secured debt in columns 3 and 4, investments in columns 5 and 6, and profitability in columns 7 and 8. Treated is a dummy variable that equals one if the firm has high tangibility (highest tercile), and zero if it has low tangibility (lowest tercile). Post is a dummy variable that equals one for the years after the bankruptcy reform was passed (2012 to 2015), and zero for the years before the reform was passed (2009 to 2011). *t*-values are reported in parentheses and are based on standard errors clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Refer to Table 2 for variable definitions.

	Leverage		Secured debt		Investments		Profitability	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post x Treated	-0.010	-0.001	-0.030***	-0.028**	-0.030***	-0.028***	0.003	0.001
	(-1.28)	(-0.13)	(-2.58)	(-2.21)	(-6.11)	(-5.32)	(0.54)	(0.12)
Post	-0.062***	-0.135***	-0.034***	-0.047**	0.020***	-0.002	-0.003	-0.011
	(-6.32)	(-3.02)	(-2.67)	(-2.04)	(3.36)	(-0.09)	(-0.39)	(-0.50)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Industry X year	No	Yes	No	Yes	No	Yes	No	Yes
Observations	3,560	3,560	2,415	2,415	3,647	3,647	3,686	3,686
Number of firms	634	634	634	634	634	634	634	634
R^2 (within)	0.067	0.122	0.035	0.061	0.019	0.063	0.005	0.021

Table 5

Bankruptcy reform in Germany and corporate leverage and investments: robustness

This table presents estimates of difference-in-differences regressions for the bankruptcy reform in Germany. The dependent variable is corporate leverage in columns 1 and 4, fixed assets in column 2, profitability in column 3, secured debt in column 5, and investments in column 6. Treated is a dummy variable that equals one if the firm has high risk (lowest tercile), and zero if it has low risk (highest tercile). Post is a dummy variable that equals one for the years after the bankruptcy reform was passed (2012 to 2015), and zero for the years before the reform was passed (2009 to 2011). *t*-values are reported in parentheses and are based on standard errors clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Refer to Table 2 for variable definitions.

	Full sample			Small firms		
	Leverage	Fixed assets	Profitability	Leverage	Secured debt	Investments
	(1)	(2)	(3)	(4)	(5)	(6)
Post x Treated	0.010***	-0.025***	0.042***	-0.004	-0.003	-0.001
	(2.71)	(-7.98)	(10.89)	(-0.47)	(-0.25)	(-0.18)
Post	-0.043***	0.014***	-0.016***	-0.047***	-0.035***	-0.001
	(-12.39)	(4.39)	(-7.14)	(-4.03)	(-2.78)	(-0.25)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No	No
Industry X year	No	No	No	No	No	No
Observations	21,798	22,132	22,086	3,546	2,380	3,631
Number of firms	3,484	3,484	3,484	635	635	635
R^2 (within)	0.027	0.012	0.049	0.031	0.018	0.011