# Empirical Evidence on Debt Governance*

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November 18, 2024

**Abstract**

A large theoretical literature suggests that debt can mitigate agency problems, yet empirical evidence is limited due to identification problems. To provide evidence, I examine whether firms implement independent directors as a substitute when debt governance becomes ineffective. Key to my analysis are two central features of debt as a governance device: first, it is only effective with bankruptcy penalties, second, it only matters for firms close to default. Consistent with debt inducing discipline, across countries, board independence is negatively related to bankruptcy penalties, and especially so among risky firms. For them, a change from strictest to softest penalties is associated with a 46% increase in the number of independent directors. Comparing changes in board independence of risky firms to those of safe firms around bankruptcy reforms confirms the cross-country results. My findings underline the role of agency problems in explaining corporate capital structure, and can further account for several unresolved issues in corporate governance (e.g., differences in bankruptcy penalties can explain 37% of the 37 percentage point "board independence gap" between the US and the UK). Moreover, my findings have important implications for optimal bankruptcy design: in the absence of bankruptcy penalties, management may have difficulties to credibly commit to forgo inefficient actions and thus to secure financing.

JEL classification: G32, G33, G34, G38, K22.
Keywords: debt, corporate governance, bankruptcy, board independence.

* I thank Lawrence Glosten, Jens Jackwerth, Axel Kind, Edward Morrison, Katharina Pistor, and Jiri Tresl.
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*"for debt to be an effective source of discipline it must be backed by an appropriate bankruptcy (or insolvency) procedure, i.e. there must be an appropriate 'penalty' in the event of default. A bankruptcy mechanism that is 'soft' on management – e.g. one that, like Chapter 11, keeps creditors at bay for a long period – may have the undesirable property that it reduces management's incentive to avoid default, thus undermining the bonding or disciplinary role of debt."*

*—Oliver Hart (1995, p. 685)*

# 1 Introduction

A large theoretical literature gives debt a fundamental role in corporate governance. In particular, it is argued that debt gives creditors control and liquidation rights when management fails to make a promised payment. This threat to its private benefits of control motivates management to reduce the probability of bankruptcy by pursuing high profits rather than less profitable personal goals. As such, debt can be a disciplinary source that allows investors (both shareholders and creditors) to restrict adverse managerial actions, and can further be a bonding device that allows management to commit to a sufficient level of efficiency in order to ensure corporate financing.[1]

The hypothesis that debt can mitigate agency problems, assuming it is true, has a number of important implications. First, it suggests that agency problems might play a key role in determining corporate capital structure (e.g., Grossman and Hart, 1982; Zwiebel, 1996). Second, it helps explaining several unresolved issues in corporate governance. For example, debt governance can explain the substantial cross-sectional variation in corporate governance structure, given that firms typically substitute between alternative governance mechanisms. Likewise, debt governance can be useful in understanding mixed empirical evidence on the effectivity of other governance mechanisms, as improved governance may be beneficial for firms with weak debt governance but has no effect for firms with strong debt governance.[2] Third, and perhaps most important, the possible ability of debt to reduce agency problems has important implications for optimal bankruptcy design. As detailed below, debt governance is only effective with bankruptcy penalties. This suggests that the absence of bankruptcy penalties may prevent firms from good governance and thus from obtaining financing (Aghion, Hart, and Moore, 1992; Hart, 2000).

[1] On the role of debt in constraining management from diverting funds, see, e.g., Grossman and Hart (1982); in inducing managerial effort, see, e.g., Dewatripont and Tirole (1994); and in curbing managerial empire building, see, e.g., Zwiebel (1996). For surveys and studies providing discussions on debt as a disciplinary and bonding mechanism, see Aghion, Hart, and Moore (1992), Hart (1995, 2000, 2001, 2017), Shleifer and Vishny (1997), and Benmelech and Bergman (2008).

[2] For the notion that improvements in corporate governance may have a different effect for firms with weak and strong governance, see Bertrand and Mullainathan (2003), Giroud and Mueller (2010, 2011), and Nini, Smith, and Sufi (2012).

Despite the large volume of theories suggesting that debt induces discipline and the importance of this hypothesis, evidence on the empirical relevance of debt governance is limited due to identification problems (summarized further below). In this paper, I attempt to provide evidence. To do so, I examine whether firms implement independent directors as a substitute governance mechanism when debt governance becomes ineffective.[3] Key to my analysis are two central features of debt as a governance device. First, debt governance is only effective with bankruptcy penalties, given that the absence of penalties undermines management's incentive to avoid bankruptcy, and, hence, reduces the incentive effect of debt to pursue high profits (Grossman and Hart, 1982; Aghion, Hart, and Moore, 1992; Hart, 1995, 2000). Second, debt governance only matters for firms close to bankruptcy, given that proximity to default ensures bankruptcy when performance is poor, and, therefore, increases the incentive to be efficient in order to avoid bankruptcy (Zwiebel, 1996; Hart, 2001).[4] Building on these features, the central test of my study is whether firms implement independent directors as a substitute when bankruptcy legislations that are soft on management make debt governance ineffective, and whether this effect is stronger for firms with high default probability.

My empirical analysis is based on a large sample of 11,965 firms from 50 countries with different management penalties in bankruptcy. I measure managerial bankruptcy penalties using the creditor rights index of La Porta et al. (1998), which contains bankruptcy costs to managerial private benefits of control by including information on management dismissal during bankruptcy, and on the likelihood of a firm liquidation as the outcome of the bankruptcy process (mainly determined by provisions that cover the ability of creditors to grab assets, and the inability of management to seek firm reorganization without creditors' consent).

To begin, I study the average relation between board independence and bankruptcy penalties. Consistent with the hypothesis that debt mitigates agency problems, I find a negative relation between board independence and managerial bankruptcy penalties. The effect is sizable. A change from strictest to softest penalties is associated with a 34% increase in the number of independent directors (or 18 percentage point increase in the fraction of independent directors

[3] In studying the interaction between alternative governance mechanisms, my study follows the notion that governance mechanisms are endogenously determined within the broader system of a firm's governance structure. That is, firms substitute between different governance mechanisms in choosing an optimal governance structure in which the demand for one mechanism depends on the strength of alternative mechanisms (Demsetz and Lehn, 1985; Hermalin and Weisbach, 2003, 2012; Adams, Hermalin, and Weisbach, 2010; Avedian, Cronqvist, and Weidenmier, 2015; Bharath and Hertzel, 2019). See Section 5.2.3 for a more detailed discussion on this. Additionally, see Section 5.2.4 for why it is not meaningful to evaluate the governance role of debt by studying the relation between debt governance and firm value (as a proxy for agency problems).

[4] Note that proximity to default increases the likelihood of bankruptcy in case of low performance not only because it increases the likelihood that profits are lower than debt dues, but also because for firms with high default probability such situations lead to actual default states, i.e., firms cannot pay off current debt dues by issuing more debt in order to avert default (Hart and Moore, 1995; Zwiebel, 1996; Hart, 2001).

to board size), suggesting that debt is viewed as a powerful mechanism for disciplining management. Notably, as the effect between board independence and bankruptcy penalties is of great economic significance, an important by-product of my findings is that they can explain large parts of the substantial cross-sectional variation in corporate board structure that is left unexplained by previously found determinants of board independence. In this sense, differences in bankruptcy penalties can, e.g., explain about 37% of the 37 percentage point difference in the average fraction of independents to board size between the US and the UK.

Next, I examine whether the negative relation between board independence and bankruptcy penalties differs across firms with high and low default probability. Further supporting the hypothesis that debt mitigates agency problems, I find that the negative relation is stronger among firms with high default probability relative to firms with low default probability. In fact, the difference in the negative relation increases monotonically by comparing more risky firms with more safe firms. Economically, for firms with high default probability, a change from strictest to softest bankruptcy penalties is associated with an increase in the number of independent directors by 46%, or 18% relative to firms with low default probability.

The difference in the negative relation across firms with high and low default probability not only provides further support on the empirical relevance of debt governance, but also improves the causal interpretation of my findings. A potential concern when looking at the average relation between board structure and bankruptcy penalties is that bankruptcy law is endogenous to board independence, i.e., that for most countries an omitted country characteristic simultaneously determines both variables such that bankruptcy penalties do not cause board dynamics. Looking at the difference in the negative relation across firms with high and low default probability mitigates this concern by reducing the identification problem to one in which for most countries an omitted country attribute not only determines bankruptcy law and board structure, but also affects board structure differently for firms with high and low default probability. Note that endogeneity problems are unlikely to be the case. Across countries, bankruptcy law is typically determined by a different reason—e.g., the 2007–2009 financial crisis for Germany; a corporate scandal for Italy; the Asian financial crisis for South Korea; an attempt to promote lending via weaker creditor rights for Brazil, and via stronger creditor rights for India; and the political power of competing interest groups for the US.[5] Additionally, these reasons should not

[5] The findings by Djankov, McLiesh, and Shleifer (2007) regarding the stability of creditor rights scores over time (the correlation between the 1978 and 2003 creditor rights indices is 0.95), the absence of convergence in bankruptcy law across countries (differences persist over the 25-year period), and the difficulty to find determinants of creditor rights (80% of the cross-sectional variation in creditor rights remains unexplained by important country characteristics, including legal origin, the level of economic development, and culture) are broadly

affect board structure, or at least not differently across firms with high and low default probability.

To further strengthen the causal interpretation of my results, I study changes in board independence around three bankruptcy reforms. The objective is to confirm the cross-country results by focusing on cases for which the determinant of the bankruptcy law is known, and should not be correlated with corporate board structure. The first reform is Germany's reform of 2012 that, prompted by the economic consequences of the 2007–2009 financial crisis, was aimed at facilitating the restructuring of distressed firms (Canipek, Kind, and Wende, 2021). The reform reduced bankruptcy penalties by introducing a debtor-in-possession proceeding (accessible without creditors' consent) that allows management to stay in corporate control during bankruptcy and moreover imposes automatic stay on the assets. The other two reforms are the 2005–2006 reforms of Italy, prompted by a corporate scandal (Rodano, Serrano-Velarde, and Tarantino, 2016). The 2005 reform, designed to facilitate firm continuation to rescue the firm, reduced bankruptcy penalties by removing strict restrictions for a debtor to enter a reorganization procedure. Afterwards, the 2006 reform increased penalties by introducing several changes to speed up liquidation procedures (which, through higher expected recovery rates, increases creditors' incentives to press for liquidation).

For each of the three reforms, I compare changes in board independence of firms with high default probability around the reform to those of firms with low default probability. Consistent with the cross-country results, I find that firms with high default probability increased (decreased) the number of independent directors after a decrease (increase) in bankruptcy penalties relative to firms with low default probability. Also the economic effects are similar to those of the cross-country analysis.

A number of additional results further support my findings. First, I obtain (qualitatively) similar results when (i) using, instead of the number of independent directors, the ratio of independents to board size as a measure of the governance intensity by the board, (ii) using, instead of Altman's Z-score, the interest coverage ratio as a measure of default probability, and (iii) excluding US and UK firms from the analysis, which account for about 60% of the sample observations. Second, I find that the negative relation between board independence and bankruptcy penalties is strongest for individual creditor rights components that typically correspond to strong bankruptcy penalties (such as management dismissal during bankruptcy, the inability of management to seek reorganization unilaterally, and the ability of creditors to grab assets)

consistent with the view that, for each country, bankruptcy law is typically determined by a different reason, and not a single reason that applies across countries.

and weakest for the component that typically corresponds to weak penalties (i.e., the right of creditors to be paid out first).

Third, a potential concern with my results from the bankruptcy reforms in Germany and Italy is that confounding factors affected board structure of high and low default probability firms differently. I find that board independence of high and low default probability firms followed parallel trends prior to the reforms, suggesting that board independence of both groups of firms generally experience similar shocks. Additionally, I find that in other countries firms with high default probability did not change board independence relative to firms with low default probability after the reforms in Germany and Italy, suggesting that the observed changes in Germany and Italy are not driven by confounding events that were common to all countries. These results, together with the fact that board structure is sticky, i.e., that board structure is determined by static factors that typically do not change over time, make it unlikely that confounding factors affect my results. Fourth, using detailed summary statistics on board structure of US firms based on hand-collected data from Graham, Kim, and Leary (2020), I provide event-study evidence on the 1979 US bankruptcy reform that reduced bankruptcy costs (Hackbarth, Haselmann, and Schoenherr, 2015; Favara et al., 2017). While board independence was constant at about 50% for four decades beginning in the 1930s, it increased to about 60% from the late 1970s to mid-1990s. Finally, I find that my results are unlikely to be driven by alternative explanations, and provide several discussions that may be helpful in gaining further insights into the findings of this paper.

### 1.1 Related literature

My study contributes to the financial contracting literature. A central hypothesis of this literature is that debt can mitigate agency problems. My contribution is to provide empirical evidence on this hypothesis. Despite the large number of financial contracting theories and the importance of this hypothesis, there is little evidence on the empirical relevance of debt governance. Existing evidence comes from studies that find a negative relation between managerial entrenchment and debt and suggest that this is consistent with entrenched managers avoiding the disciplinary role of debt (Berger, Ofek, and Yermack, 1997; Garvey and Hanka, 1999), or from studies that find a positive relation between debt and firm value and suggest that this is consistent with debt is valued as a governance device (e.g., Jung, Kim, and Stulz, 1996; Harvey, Lins, and Roper, 2004). However, these papers examine the governance role of debt in general, that is, the incentive effect of debt that comes from various mechanisms, including, besides the threat of managerial bankruptcy penalties, also forcing management to disgorge free cash flow

(e.g., Jensen, 1986), increased monitoring by creditors (Harvey, Lins, and Roper, 2004), or the threat of managerial restrictions following covenant violation (see below). Additionally, given their reliance on cross-sectional or event-study analyses, these studies are limited by the potential endogeneities in the relations between debt and the other variables, making it difficult to draw reliable conclusions.[6] Different than these studies, I exploit two key features of debt as a governance device that allow me to provide direct and credible empirical evidence on the incentive effect of debt that comes through bankruptcy penalties.

My paper also contributes to the literature on optimal bankruptcy design. In particular, my findings in support of debt as an effective source of discipline provide empirical evidence consistent with the notion that "a good bankruptcy procedure is one that ( … ) preserves the (ex ante) bonding role of debt by penalizing management adequately in bankruptcy states." (Aghion, Hart, and Moore, 1992, pp. 532–533). Without bankruptcy penalties, management may have difficulties to credibly commit to refrain from inefficient actions and thus to secure financing ex ante (Aghion, Hart, and Moore, 1992; Hart, 2000). To the best of my knowledge, this aspect is not considered by the current bankruptcy literature, which almost exclusively focuses on how firm financing might be affected by bankruptcy law through collateral value and distress costs.[7] It is important to note that while my findings are important in general, they may be of particular importance in the context of the recent crises during which many countries have significantly softened their bankruptcy law.[8]

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[6] Notably, revisiting the analyses of Berger, Ofek, and Yermack (1997) and Garvey and Hanka (1999) with a larger sample and more robust econometric methods, John and Litov (2010) find that the relationship between managerial entrenchment and leverage is actually positive, and not negative, consistent with their hypothesis that entrenched managers receive better access to debt financing as a response to a more conservative investment policy that is aligned with creditors' interests. For a detailed discussion on the conflicting "managerial entrenchment" and "creditor alignment" hypotheses, see Ji, Mauer, and Zhang (2020), who also provide a brief review of the mixed empirical evidence in the literature on the entrenchment-leverage relation.

[7] The current bankruptcy literature almost exclusively focuses on two channels when asking whether stronger creditor rights facilitate or hamper corporate financing (Acharya, Amihud, and Litov, 2011; Vig, 2013; Rodano, Serrano-Velarde, and Tarantino, 2016; Mann, 2018; Canipek, Kind, and Wende, 2021; Schoenherr and Starmans, 2022). Stronger creditor rights can reduce credit costs through higher collateral value and thus may allow firms to increase debt financing. In contrast, stronger creditor rights can increase distress costs and thus may prompt firms to reduce debt financing. My study contributes to this debate by pointing to another channel through which creditor rights can affect firm financing: as noted above, stronger creditor rights can enable debt as a powerful mechanism to discipline management, which can reduce capital costs of equity (by limiting managerial expropriation) as well as debt (by lowering default probability) and thus may allow firms to increase financing. Note that this channel offers alternative explanations to existing findings. For example, as a response to stronger creditor rights, a documented increase in debt financing may not be because of lower interest rates through higher collateral value, but because of lower interest rates as a result of better debt governance (or, as another possibility, simply because firms set debt as a governance mechanism, as argued by the financial contracting literature). Likewise, an observed decrease in corporate leverage may not be because of higher distress costs, but because firms increased equity financing by lower capital costs of it, while their demand for debt remained unchanged.

[8] In an attempt to protect distressed firms from liquidation, e.g., Germany and the UK have softened their laws as a response to the 2007–2009 financial crisis and the Covid-19 crisis, respectively (Canipek, Kind, and Wende, 2021; Payne, 2021). While under some circumstances suspending bankruptcy penalties temporarily may be useful, my findings suggest that repealing them permanently may result in substantial costs.

I also contribute to the literature that examines the determinants of board independence—a variable that varies widely across countries and across firms (Doidge, Karolyi, and Stulz, 2007; Ferreira and Kirchmaier, 2013). While it is recognized that country characteristics have a greater explanatory power than firm characteristics, "much of the cross-sectional variation in board independence remains unexplained." (Ferreira and Kirchmaier, 2013, p. 212; see also Doidge, Karolyi, and Stulz, 2007).[9] Additionally, it has been difficult to provide credible causal effects of country and firm characteristics on board structure, and moreover to find characteristics that have an economically rather than only statistically significant effect on the composition of the board (Ferreira, Ferreira, and Mariano, 2018).[10] My findings suggest a new determinant of board independence: the availability of debt governance, which depends on country-level bankruptcy law (whether debt governance is effective) and firm-specific bankruptcy risk (whether debt governance matters). My results help to explain the existence of the independence gap across countries with different bankruptcy penalties (e.g., my findings can explain more than one third of the difference in board structure between the US and the UK) and variation in board independence across firms with different default probabilities. The effect of debt governance on board independence is of great economic significance, especially if compared to the effects of most previously found determinants of board independence. Given the experimental design, it is unlikely that the results are affected by endogeneity problems.

Finally, my paper is also related to a growing body of empirical research that shows that creditors can constrain managerial discretion in situations of covenant violation. Taken together, these studies find that violation rarely results in termination. Instead, creditors use the threat of accelerating the loan to renegotiate tighter restrictions on corporate financial, investment, and governance policy (Chava and Roberts, 2008; Nini, Smith, and Sufi, 2009, 2012; Roberts and Sufi, 2009a, 2009b; Roberts, 2015; Ferreira, Ferreira, and Mariano, 2018). As a result, it has been argued that the threat of managerial restrictions can have a disciplinary

[9] Boone et al. (2007) and Linck, Netter, and Yang (2008) respectively show that important firm characteristics can only explain a maximum of 31% and 22% of the variation in board independence of US firms. In contrast, Doidge, Karolyi, and Stulz (2007) show that up to 72% of the variation in firm-level governance can be explained by country-level dummy variables. However, when the authors try to explain the country effects with country characteristics that the literature believes to be associated with corporate governance, such as the levels of economic and financial development, shareholder rights, or the quality of legal enforcement, they find that these variables can only explain 18% of the variation in corporate governance.

[10] As noted by Ferreira, Ferreira, and Mariano (2018), the economic significance of the effects of important firm characteristics on board independence is low in virtually all regressions in the literature. For example, Boone et al. (2007) show that a one-standard-deviation change in firm size, firm age, number of business segments, CEO tenure, and CEO ownership is associated with a 1.8, 2.4, 1.3, 1.9, and 4.8 percentage point change in board independence, respectively (see also Ferreira, Ferreira, and Raposo, 2011, who report similar results, and additionally obtain an effect of 1.2 percentage points for changing leverage by one standard deviation). The study by Ferreira, Ferreira, and Mariano (2018) is an important exception. The authors show that the number of independent directors increases by 24% following financial covenant violations.

function (see Bharath and Hertzel, 2019, who find evidence consistent with this view). As noted, unlike these studies, I do not consider the incentive effect of debt that comes from managerial restrictions following covenant violation but the incentive effect of debt that comes from bankruptcy penalties. However, like these studies, my analysis provides empirical evidence consistent with a rising view in the empirical corporate governance literature that debt plays an important role in the governance of firms. This fact has been largely ignored by the traditional literature that primarily focuses on the ability of equity-based governance mechanisms to mitigate agency problems (Nini, Smith, and Sufi, 2012; Bharath and Hertzel, 2019).

The remainder of the paper proceeds as follows. Section 2 describes the data, discusses the measures for board independence and bankruptcy penalties, and provides summary statistics. Section 3 presents the main findings from the cross-country analysis. Section 4 presents the findings from the bankruptcy reforms. Section 5 discusses the robustness of the findings to alternative explanations and offers discussions that may provide further insights into the findings of this paper. Section 6 concludes.

## 2 Data and summary statistics

### 2.1 Data

I study the relation between board independence, bankruptcy penalties, and default probability, after controlling for country and firm characteristics. In doing so, I use data from various sources. I obtain board data from the BoardEx database. The data on creditor rights (as a country-specific measure of managerial bankruptcy penalties) are from 2003 and come from Djankov, McLiesh, and Shleifer (2007)—who updated and enlarged the data of La Porta et al. (1998). Other country-level variables are from Djankov, McLiesh, and Shleifer (2007), Djankov et al. (2008), and the World Bank databases. The dataset is completed by firm-level variables (including the necessary variables to construct Altman's Z-score as a firm-specific measure of default probability) sourced from Worldscope. Table A.1 in the Appendix presents detailed variable definitions and data sources.

After merging the databases (I match firms in BoardEx to their accounting data in Worldscope using ISIN codes), I begin the sample construction with choosing the sample period 2002–2016. I choose this sample period to allow for time-series data that cover the years around the bankruptcy reforms that are used as natural experiments, although my results are unaffected when focusing on other periods. Following the conventions in the board literature and international studies (e.g., Ferreira, Ferreira, and Mariano, 2018; and, e.g., Brockman and Unlu, 2009; Favara et al., 2017), I exclude firms from financial industries (SIC codes 6000–

6999). Additionally, I exclude each firm-year observation without complete data on all dependent and control variables used in the main empirical analysis, without data on Altman's Z-score, and with negative or zero total assets or sales.[11] Finally, I winsorize all firm-level control variables at the first and ninety-ninth percentiles to account for outliers. The final sample consists of 86,913 firm-year observations from 11,965 firms in 50 countries.[12]

### 2.1.1 Data on board independence

By monitoring management and pushing for CEO dismissal in case of poor performance, independent directors can perform an incentive effect on management quality similar to that one typically associated with debt governance and can thus serve as a substitute for solving agency problems. Following Ferreira, Ferreira, and Mariano (2018), I consider the actual number of independent directors as the primary measure of the governance intensity by the board and not the ratio of independent directors to board size for two reasons. First, independent directors can exert pressure on management regardless of the board size or their fraction in the board. The more independents, the higher is the probability that there is someone who is "unfriendly", that is, someone who asks the management the right questions, or initiates a CEO dismissal by making the first move in expressing doubts on management performance to other board members or by even making a motion of CEO dismissal (Anderson, Mansi, and Reeb, 2004). Second, ratios are not informative about what happens to the number of independent directors and the board size after changes in boards, while focusing on levels allows for such inference (Ferreira, Ferreira, and Mariano, 2018). However, for robustness, I also present the results for the ratio of independents to board size as an alternative measure of the board's governance intensity, which is also indicative regarding the influence of independent directors on board decisions (Anderson, Mansi, and Reeb, 2004). Additionally, I present the results for board size, which allows to infer whether independents replace outgoing directors or are added to the board after possible changes in the board (Ferreira, Ferreira, and Mariano, 2018).

[11] Following Ferreira, Ferreira, and Mariano (2018), I drop financial industries, but keep regulated industries (SIC codes 4800–4949). Following Favara et al. (2017), I drop firm-years with negative or zero total assets or sales. My results remain unaffected when also excluding regulated industries and/or also including firm-years with negative or zero total assets or sales.

[12] Data coverage of BoardEx improved over the course of the 2000s (Ferreira and Kirchmaier, 2013). However, my findings are unaffected by possible composition effects of the BoardEx database, as analyses for individual years (e.g., 2002, 2009, or 2016) lead to similar results as those from the main analysis for the years 2002–2016. Note that also the findings of the natural experiments are unaffected by possible composition effects, given that the analyses require data availability prior to the reforms.

### 2.1.2 Data on bankruptcy penalties

I exploit that for debt to be an effective source of discipline, there must be a bankruptcy procedure that sufficiently penalizes management in default (Grossman and Hart, 1982; Aghion, Hart, and Moore, 1992; Hart, 1995, 2000). I use the creditor rights index of La Porta et al. (1998) as a country-specific measure of managerial bankruptcy penalties. The creditor rights index, CRIGHTS, is comprised by four binary components that capture the power of secured creditors against management in bankruptcy: AUTOSTAY, which equals one if secured creditors are able to seize their collateral after the reorganization petition is approved, that is, if there is no automatic stay on the assets, and zero if automatic stay prevents the debtor from secured creditors; REORG, which equals one if there are restrictions, such as creditors' consent, when a debtor files for reorganization, and zero if management can seek protection from creditors by filing for reorganization unilaterally; SECURED, which equals one if secured creditors are paid first out of the proceeds of liquidating the firm, and zero if other claimants, such as the government or workers, are given absolute priority; and MANAGES, which equals one if an administrator is automatically appointed for running the business during the reorganization procedure, that is, management is dismissed in the reorganization procedure, and zero if management retains corporate control during reorganization (see Table A.1 in the Appendix for details). Consequently, the index ranges from zero to four and higher values indicate stricter penalties on management in bankruptcy.

### 2.1.3 Control variables

To mitigate the concern that the relation between board independence and bankruptcy penalties is driven by a factor that simultaneously determines both variables, I control for a long list of country and firm characteristics that are possible determinants of board structure and bankruptcy law.[13] Specifically, the country characteristics include legal origin, which has been shown to be an important determinant of creditor rights for some countries, given that for these countries bankruptcy law is rather not written from the scratch but adopted through conquest, imperialism, or imitation from some legal families (La Porta et al., 1998; Djankov, McLiesh, and Shleifer, 2007). Furthermore, I include shareholder rights (SHRIGHTS), because firms in countries with weak shareholder rights may implement alternative instruments as substitute governance mechanisms (La Porta et al., 1998; Dahya, Dimitrov, and McConnell, 2008). I also control for the quality of legal enforcement (rule of law), which may substitutes with board

[13] Note that considering firm and country characteristics also allows to compare firms with similar characteristics (for more, see footnote 19 below), and to account for possible alternative explanations of the independence-penalty relation (for more, see Section 5 below).

independence (see La Porta et al., 1998, who argue that well-functioning courts can step in and rescue investors expropriated by management), or, as another possibility, may increase the productivity of other governance mechanisms (see Doidge, Karolyi, and Stulz, 2007; Aggarwal et al., 2009, who argue that commitments of other governance mechanisms are more credible with stronger enforcement). Finally, I consider the levels of financial development (market cap) and economic development (GDP per capita), following Doidge, Karolyi, and Stulz (2007) and Aggarwal et al. (2009), who argue that in countries with better financial development it may be more beneficial to invest in firm-level governance (since firms can receive more funding from the capital markets, thus benefiting more from governance related reductions in the cost of financing) and that in countries with better economic development it may be less costly to invest in firm-level governance (as it is less expensive to find individuals with the skills necessary to perform good governance).[14]

Following Boone et al. (2007) and Ferreira, Ferreira, and Raposo (2011), the firm characteristics include size, because size can involve more agency problems and thus requires more board monitoring, and because firms grown into different business lines require additional monitoring by specialized board members; free cash flow and profitability (return on assets), because these variables may be related to agency conflicts and private benefits available to management and thus to the advantages of monitoring; and the market-to-book ratio as well as return volatility, because for high growth firms and firms with more volatility outsider monitoring may be more costly and less effective.[15] Additionally, I control for insider ownership, because higher ownership increases managers' and controlling shareholders' cost of extracting private benefits and hence reduces the need to mitigate agency conflicts by stronger board monitoring (Doidge, Karolyi, and Stulz, 2007);[16] and for leverage, which is related to the effectivity of debt governance (Zwiebel, 1996; Hart, 2001) and hence may affect the need of independent directors as a substitute governance device.

For robustness, in Table A.2 in the Appendix, which repeats the main analyses of Tables 2 and 3 below, I consider a number of other country-level control variables. These variables

[14] Note that by finding a positive relation between GDP per capita and creditor rights, Djankov, McLiesh, and Shleifer (2007) suggest that economic development may also be a determinant of bankruptcy law. However, given that stronger creditor rights may facilitate financing, it is unclear whether economic development determines creditor rights or whether the opposite is true.

[15] Note that including return volatility (standard deviation of return on assets) as a control variable requires that firms have at least two observations to be included in the sample, i.e., the analysis excludes firms with only one observation (there are about 500 such firms). The findings remain unaffected when dropping return volatility as a control variable and including firms with only one observation.

[16] For many sample firms, information on insider ownership is not available in Worldscope for some years (while being available for other years). In case of missing data, I use the average ownership value computed by the years for which data is available. My results remain unaffected when excluding firm-years without ownership data, or when extending the sample by also including firms for which ownership data is never available.

include accounting standards (which may substitute or compliment with board independence, see La Porta et al., 1998; Anderson, Mansi, and Reeb, 2004), average institutional ownership in a country (which is shown to affect corporate governance, see Aggarwal et al., 2011), the board structure of a country (one-tier, two-tier, or mixed), and board rules on whether a country requires or encourages firms to increase board independence (rule-based, comply-or-explain, or no rule). While the inclusion of each of these controls reduces sample size (i.e., the number of countries) considerably, the relation between board independence, creditor rights, and bankruptcy risk remains unaffected.[17]

### 2.2 Summary statistics

Table 1 presents summary statistics for the main variables at the country level.[18] Three facts are worth mentioning. First, board independence varies significantly across countries, and the variation is persistent over time (and seems to be related to creditor rights). For example, the US (CRIGHTS=1), Canada (1), the UK (4), and Germany (3) are countries which are relatively similar in economic and financial development, but strikingly different in board independence. Columns 1 and 5 show that, in the US and Canada, the average number of independent directors/ratio of independents to board size is 6.2/75% and 6.1/73%, respectively, while, in the UK and Germany, it is only 2.7/38% and 1.8/13%, respectively. Columns 2 and 6 show the average within-firm yearly growth in the number of independent directors and in the ratio of independents to board size. As can be seen, there is a general trend to more independent boards, probably resulting from the worldwide board reforms within the last two decades that require or encourage firms to increase board independence (Ferreira and Kirchmaier, 2013; Fauver et al., 2017). However, the "independence gap"—defined by Ferreira and Kirchmaier

[17] There are also other firm-level variables that might affect board independence such as firm age, number of business segments, or R&D expenditures (Boone et al., 2007; Ferreira, Ferreira, and Raposo, 2011); or the strength of other governance mechanisms that can substitute for board independence such as incentive compensation or takeover provisions (Demsetz and Lehn, 1985; Hermalin and Weisbach, 2003, 2012; Adams, Hermalin, and Weisbach, 2010; Avedian, Cronqvist, and Weidenmier, 2015; Bharath and Hertzel, 2019). I do not control for these variables because of missing data or because their inclusion typically considerably reduces sample size. However, note that possible endogeneity problems due to the omission of variables are mitigated by the fact that the central test of the paper is to study the interaction between board independence, bankrupt penalties, and bankruptcy risk, and there is no obvious reason why omitted variables should be related differently to countries with different bankruptcy penalties as well as firms with different default probabilities. Also note that I employ firm fixed effects in the natural experiments in Section 4, which allow to account for time-invariant variables. Finally, in unreported results, I repeat the main analyses in this paper using Worldscope data on firm age and R&D expenditures and find that the results remain virtually unaffected.

[18] For comparison, Ferreira and Kirchmaier (2013) report similar numbers on board characteristics for a sample of 29 countries in 2010 using BoardEx. For example, for the US and the UK, they report an average board size of 8.42 and 6.50, respectively, and an average ratio of independent directors to board size of 74% and 34%, respectively. The numbers for the US are also similar to those of other studies that focus on US firms and use the Investor Responsibility Research Center (IRRC) database for data on boards (e.g., Ferreira, Ferreira, and Raposo, 2011).

(2013) as the variation in board independence across countries—is persistent over time, as countries with low levels of board independence do not exhibit a more aggressive increase in independent board monitoring than countries with high levels of board independence. Taken together, this suggests an important role for static country variables, such as creditor rights, in shaping the independence gap.[19]

Second, there is little within-firm variation in board independence. Column 3 shows that the average firm changes its number of independent directors only 0.37 times per year (or 0.25 times per year when subtracting the trend component of column 2), i.e., only about every 2.7 years (or 4.0 years). Column 4 shows that the within-firm standard deviation of the number of independents is small as well, indicating that the rare changes in board independence lead only to minor modifications of the board.[20] This sticky feature of board structure suggests that board structure is determined by static firm factors that typically do not change over time (such as industry affiliation or bankruptcy risk), which provides a good environment for studying changes in board structure as a response to a bankruptcy reform since possible adjustments in board independence can be better attributed to the change in the bankruptcy law and not to possible confounding shocks.[21]

Finally, note that observations from the US and the UK respectively account for 45% and 15% of the full sample observations. I will show that the findings are similar when excluding US and UK firms.

# 3 Cross-country study

## 3.1 Average relation

As described in the Introduction, the central analysis in this paper is whether firms implement independent directors as a substitute governance mechanism when bankruptcy laws that are soft on management make debt governance ineffective, and whether this effect is stronger

[19] Note that the summary statistics suggest that board independence and creditor rights seem to be negatively related, particularly when comparing countries that roughly contain firms with similar characteristics in terms of firm-level and country-level properties (which is important, as characteristics such as firm size are typically related to board independence so that by comparing firms with different characteristics the observed relation between board independence and creditor rights may simply be the reflection of the size effect). For example, while the US and Canada have high board independence and low creditor rights, the UK and Germany have low board independence and high creditor rights. Nordic countries provide another example. Despite the similar macroeconomic characteristics, the countries are dissimilar in board structure and creditor rights. In the countries with weak creditor rights, Finland (CRIGHTS=1), Sweden (1), and Norway (2), the average ratio of independent directors to board size is 85%, 54%, and 43%, respectively, while it is 41% for Denmark (3) with strong creditor rights.

[20] From the 74,948 possible within-firm changes in the number of independent directors in my sample, a change took place in only 27,753 cases. For these cases, in only 6,461 cases more than one independent was added to or removed from the board, and in only 1,535 cases more than two independents were added or removed.

[21] On the stickiness of board structure, see also Graham, Kim, and Leary (2020).

for firms with high default probability. In a first step, I study the average relation between board independence and bankruptcy penalties. To do so, I estimate the following ordinary least squares (OLS) panel regression:

$$Dependent\ variable_{i,j,c,t} = \alpha + \beta CRIGHTS_c + \boldsymbol{\lambda X}_{i,j,c,t} + \boldsymbol{\psi y}_t + \boldsymbol{\theta a}_j + \epsilon_{i,j,c,t}, \qquad (1)$$

where the dependent variable is either the logarithm of the number of independent directors, the ratio of the number of independent directors to board size, or the logarithm of board size; $i$ indexes firms, $j$ indexes industries, $c$ indexes countries, and $t$ indexes time; $CRIGHTS_c$ is the creditor rights index as a measure of managerial bankruptcy penalties; $\boldsymbol{X}_{i,j,c,t}$ is a vector of the firm and country characteristics discussed above; $\boldsymbol{y}_t$ is a vector of year fixed effects that control for time-varying factors common to all firms; and $\boldsymbol{a}_j$ is a vector of industry fixed effects (based on the two-digit SIC code) that control for possible differences across firms from different industries. Standard errors are clustered by country; although conclusions are identical when the errors are clustered by firm.[22][23]

Panel A of Table 2 reports the results for the logarithm of the number of independent directors (plus one to also consider observations with zero independents) as the primary measure of the governance intensity by the board. Consistent with the hypothesis that debt mitigates agency problems, columns 1 (without controls) and 2 (with controls) show that the coefficient on $CRIGHTS_c$ is negative and statistically significant, i.e., board independence is negatively related to managerial bankruptcy penalties. The economic effect is sizable. Column 2 shows that a change from strictest (when debt governance is most effective) to softest (when debt governance is least effective) penalties is associated with an approximately 34% increase in the number of independent directors (or an increase of 0.34 x 4.8 = 1.6 independents, based on the

[22] The OLS specification follows those employed by Benmelech and Bergman (2008) and Favara et al. (2017). Note that, following Ferreira, Ferreira, and Mariano (2018), I use the logarithm of the number of independent directors to estimate percentage changes in the number of independents.

[23] I cluster standard errors at the country level because observations may be correlated within countries (corporate governance is likely to be correlated within a country because some governance rules are mandated by country-level regulations (Aggarwal et al., 2011)). This method is in line with other cross-country studies that examine the effect of firm and country characteristics on firm-level corporate governance (Doidge, Karolyi, and Stulz, 2007; Aggarwal et al., 2009; Aggarwal et al., 2011). However, the summary statistics above show that board structure is persistent within a firm, suggesting that within a firm observations may not be independent over time (on this, see also Aggarwal et al., 2011). In unreported results, I mitigate this concern in two ways. First, I cluster standard errors at the firm level (Aggarwal et al., 2011). I find that the errors are lower than the errors clustered at the country level, suggesting that clustering errors by country presents a more moderate method. Second, I estimate standard errors using country-level clustering, but only including observations from one individual year (e.g., 2002, 2009, or 2016). I find that the results are similar to those of the main analysis.

sample average of the number of independents presented in Table 1 above), suggesting that debt is valued as a powerful instrument to discipline management.

Importantly, as the effect between board independence and bankruptcy penalties is of great economic significance, especially if compared to the effects of most previously found determinants of board independence, an important by-product of my results is that they can explain large parts of the substantial cross-sectional variation in board independence that is left unexplained by other determinants.[24] In this sense, differences in management penalties in bankruptcy between the US (CRIGHTS=1) and the UK (CRIGHTS=4) can explain about (1.6 x ¾) / (6.2 – 2.7) = 34% of the difference in the average number of independent directors between both countries.

In columns 3 to 6, I also examine the relation between the number of independents and individual components of the creditor rights index. As shown, the negative relation is strongest for all three components that typically correspond to strong management penalties in bankruptcy—i.e., provisions that impose costs on managerial private benefits of control either within the bankruptcy procedure by mandating the dismissal of management during bankruptcy (MANAGES), or via inducing firm liquidation as the outcome of the bankruptcy procedure by precluding management to file for firm reorganization unilaterally (REORG) or by not allowing automatic stay on assets (AUTOSTAY). In contrast, the negative relation is weakest and statistically insignificant for the component that typically corresponds to weak bankruptcy penalties––i.e., the provision that gives secured creditors the right to be paid out first (SECURED), which might impose penalties only indirectly via higher incentives of creditors to press for liquidation.[25] These results lend further support to the notion that firms implement independent directors as a substitute when insufficient bankruptcy penalties make debt governance ineffective.

Columns 7 and 8 respectively show the estimates when US firms and both US as well as UK firms are excluded. As can be seen, also when excluding firms of both countries which account for about 60% of the full sample observations, I find a negative relation between the number of independent directors and managerial penalties in bankruptcy (the economic and statistical effects are lower compared to those of the full sample, however, Section 3.2 below

[24] On the low economic effects of other determinants of board independence, see Boone et al. (2007), Doidge, Karolyi, and Stulz (2007), Linck, Netter, and Yang (2008), Ferreira, Ferreira, and Raposo (2011), and Ferreira, Ferreira, and Mariano (2018).

[25] Notably, Section 3.2 below shows that for firms with high default probability, i.e., when debt governance matters, there is actually a statistically significant negative relation between board independence and SECURED; although the negative relation is weaker compared to those of the other components of the creditor rights index.

shows that the effects appear large when focusing on those firms that actually drive the negative relation, i.e., firms with high default probability for which debt governance is most effective).[26]

For robustness, in Panel B, I repeat the analysis for the fraction of independent directors to board size as an alternative measure of the board's governance strength. As can be seen, the findings are (qualitatively) similar to those of Panel A. Column 2 implies that switching off debt governance by moving from the strictest to softest management penalties in default is associated with an approximately 18 percentage point increase in the fraction of independents to board size. In terms of explaining cross-sectional variation, the results imply that differences in bankruptcy penalties can, e.g., explain about (0.18 x ¾) / (0.75 – 0.38) = 37% of the 37 percentage point difference in the average ratio of independents to board size between the US and the UK. Note that the results not only ensure the robustness of the findings, but also indicate that substantial board and voting power is given to independent directors when debt governance is ineffective.

Finally, to infer whether independent directors replace dependents or are added to the board when debt governance becomes ineffective, Panel C presents the estimates for the logarithm of board size as the dependent variable. As shown, in general, there is no statistically significant relation between board size and bankruptcy penalties, suggesting that independents replace dependents instead of being added to the board. The result is, on the one hand, consistent with the notion that small boards of directors are more effective in monitoring management (Yermack, 1996), and, on the other hand, suggests that the fraction of independent directors on the board is increased at minimal costs.

### 3.2 Difference in default probability

Next, I study whether the negative relation between board independence and bankruptcy penalties differs across firms with high and low default probability.[27] To this end, I expand the regression in equation (1) by the interaction term $HighRisk_{i,j,c,t} \times CRIGHTS_c$ (as well as $HighRisk_{i,j,c,t}$), where $HighRisk_{i,j,c,t}$ is a dummy variable that equals one if a firm has high default probability (e.g., if it has bankruptcy risk above the median bankruptcy probability distribution of its country), and zero if it has low default probability. I measure bankruptcy risk

[26] Note that the description of the economic effect based on a change from highest to lowest creditor rights, the analysis of the individual creditor rights components to further support the findings, and the exclusion of US and UK firms to ensure the robustness of the findings follow the cross-country studies of Brockman and Unlu (2009), Acharya, Amihud, and Litov (2011), and Favara et al. (2017), who study the effect of bankruptcy law design on other firm-level characteristics, such as dividend payouts, leverage, investments, or risk taking.

[27] For studies that measure the effects of bankruptcy law design on other firm characteristics using variation in the effect of the law in default probability, see, e.g., Rodano, Serrano-Velarde, and Tarantino (2016), Favara et al. (2017), and Schoenherr and Starmans (2022).

with Altman's Z-score (Altman, 1968). Table A.3 in the Appendix repeats the analysis of Table 3 below using the interest coverage ratio as a proxy for the probability of default. The findings are virtually identical.

Panel A of Table 3 shows the results for the logarithm of the number of independent directors. In column 1, $HighRisk_{i,j,c,t}$ equals one if a firm is in the upper half of the bankruptcy probability distribution of its country for a given year (low Z-score), and zero otherwise (high Z-score). Further supporting the empirical relevance of debt governance, the coefficient on the interaction between high default probability and creditor rights is negative and statistically significant. That is, the negative relation between board independence and creditor rights is stronger among firms with high default probability relative to firms with low default probability. The estimates imply that the marginal effect between creditor rights and the number of independent directors is 7% among firms with low default probability, whereas the marginal effect is 10% (0.073 + 0.024) among firms with high default probability.

In column 2, I separate firms into three terciles, and define firms in the highest tercile as firms with high default probability and firms in the lowest tercile as firms with low default probability (cutting off the middle 33% of the bankruptcy probability distribution). In column 3, I separate firms into four quartiles, and define firms in the highest quartile as firms with high default probability and firms in the lowest quartile as firms with low default probability (cutting off the middle 50% of the bankruptcy probability distribution). Strikingly, across columns 1 to 3, the negative coefficient on the interaction term increases monotonically (both in terms of economic and statistical significance), implying that the difference in the negative relation increases the more particularly risky firms are compared to particularly safe firms.[28] Regarding the economic significance, column 3 shows that, for firms with high default probability, a change from the strictest to the softest bankruptcy regime is associated with an increase in the number of independent directors by 46%, or 18% (4 x 0.045) relative to firms with low default probability.[29]

[28] In unreported results, I study the relation between the number of independents and creditor rights separately for the four quartiles. I find that the negative relation is weakest among firms with low default probability, increasing in default probability, and strongest among firms with high default probability. Specifically, the coefficients on $CRIGHTS_c$ for the first (low default probability), second, third, and fourth (high default probability) quartiles respectively are -0.070 (*t*-value=-2.80), -0.073 (*t*-value=-3.57), -0.080 (*t*-value=-4.61), and -0.117 (*t*-value=-6.55).

[29] Note that, to be considered in the analysis, for a given year a country needs to have at least two firms in column 1, three firms in column 2, and four firms in column 3, which explains changes in the number of countries across Tables 2 and 3 or across columns 1 to 3 in Table 3. Also note that dividing firms by the bankruptcy probability distribution of their country for a given year may lead to an insufficient differentiation between high and low default probability firms in countries with few firms for a given year. Alternative possibilities are to divide firms by the distribution over all years, by the distribution over all countries, or to set a specific threshold of Altman's Z-score that identifies high and low default probability firms (a commonly used rule is, e.g., to define firms with

Columns 4 to 7 show the results when interacting $HighRisk_{i,j,c,t}$ (quartile separation) with the individual creditor rights components, i.e., when studying differences across high and low default probability firms in the relations between board independence to the individual components. As shown, the difference in the negative relation across firms with high and low default probability is strongest for the provisions that typically impose strong bankruptcy costs (MANAGES, REORG, AUTOSTAY), and weakest for the provision that typically imposes the weakest costs (SECURED). Finally, columns 8 (median separation) and 9 (quartile separation) present the estimates when excluding firms from the US and the UK. As can be seen, all findings are supported. A notable difference to the full sample is that, in the more general case here, no statistically significant relation between board independence and bankruptcy penalties exists among firms with low default probability (e.g., column 9 shows that, among safe firms, the coefficient on $CRIGHTS_c$ has a *t*-value of -0.91).[30]

Panel B of Table 3 presents the results for the ratio of independents to board size as the dependent variable. As can be seen, the findings remain (qualitatively) unaffected. Column 3 shows that, for firms with high default probability, a change from strictest to softest bankruptcy penalties is related to an increase in the ratio by 22 percentage points, or 5 percentage points relative to firms with low default probability. Panel C presents the estimates for board size as the outcome variable. As shown, board size tends to be more negatively related to creditor rights for firms with high default probability relative to firms with low default probability, yet the difference in the negative relation is statistically insignificant for the more general case in which the US and the UK are excluded.

### 3.3 Difference in default probability and causal inference

The result that the negative relation between board independence and bankruptcy penalties differs for firms with high and low default probability not only provides further support on the

a Z-score below 1.8 as risky firms and firms with a Z-score above 3.0 as safe firms). In unreported results, I find that my findings remain virtually identical when using the alternative possibilities.

[30] There are at least two reasons why also among safe firms board independence and creditor rights can be negatively related. First, as discussed in Section 3.3 below, it might be the case that creditor rights are endogenous to board structure, i.e., an omitted country characteristic simultaneously drives both variables. While this is rather unlikely for most countries as across countries bankruptcy law is typically determined by a different reason (and these reasons typically should not affect board structure), it is possible when considering only two countries. The result that, among safe firms, board independence and creditor rights are not correlated when considering most countries (i.e., when excluding the US and the UK) but are correlated when considering the US and the UK (which account for more than half of the observations) seems to be consistent with this view. Put differently, for the US and the UK, there might be an omitted country variable that simultaneously determines board independence and bankruptcy law. Second, as discussed in Section 5 further below, bankruptcy penalties may make other governance mechanisms for which bankruptcy risk is not necessary to function more effective, thereby possibly also playing a governance role for safe firms.

empirical relevance of debt governance, but also improves the causal interpretation of my findings. Specifically, the main concern when identifying the empirical role of debt governance by looking at the average relation between board structure and bankruptcy penalties is that bankruptcy law might be endogenous to board independence, that is, that for most countries an omitted country characteristic simultaneously determines both variables such that bankruptcy penalties do not cause board dynamics. Identifying the empirical relevance of debt governance by looking at the difference in the negative relation across firms with high and low default probability mitigates this concern by reducing the identification problem to one in which for most countries an omitted country attribute not only determines bankruptcy law and board structure, but also affects board structure differently for firms with high and low default probability (put differently, the feature that debt governance matters only for firms with high default probability gives something of a "natural control group" in firms with low default probability that control for country characteristics common to all firms).

Note that endogeneity problems are unlikely to affect my findings. Across countries, bankruptcy law is typically determined by a different reason—e.g., for Germany in 2012, the 2007–2009 financial crisis that led to weaker creditor rights to rescue distressed firms (Canipek, Kind, and Wende, 2021); for Italy in 2005, a corporate scandal leading to weaker creditor rights to rescue the firm without violating European laws (Rodano, Serrano-Velarde, and Tarantino, 2016); for South Korea in 2006, the 1997–1998 Asian financial crisis that led to a management-friendly law as demanded by the IMF and World Bank in exchange for financial support (Schoenherr and Starmans, 2022); for Brazil in 2005, an attempt to promote lending via weaker creditor rights (Ponticelli and Alencar, 2016; Favara et al., 2017); for India in 2002, an attempt to promote lending via stronger creditor rights (Vig, 2013); for India before 2002, political considerations on electoral outcomes leading to lower creditor rights as layoffs could have a negative effect on electoral outcomes (Vig, 2013); for the UK in 2020, the Covid-19 crisis that led to weaker creditor rights to rescue distressed firms (Payne, 2021); and for the US in 1979, the political power of competing interest groups that resulted in a debtor-friendly law (Posner, 1997).[31] Additionally, these reasons should not affect board structure, or at least not differently across firms with high and low default probability.

[31] While the process of the US bankruptcy reform of 1979 was triggered by increasing dissatisfaction with the bankruptcy law (the law was considered unnecessarily complicated and intolerably ambiguous), the final statue was just a reflection of the relative political power of competing interest groups, such as debtors, managers, creditors, lawyers, judges, and politicians (Posner, 1997; Hackbarth, Haselmann, and Schoenherr, 2015).

## 4 Changes in board independence around bankruptcy reforms

To further strengthen the causal interpretation of my findings, I study changes in board structure of firms with high default probability relative to those of firms with low default probability around bankruptcy law reforms.[32] The objective of the analysis is to confirm the cross-country findings by focusing on cases for which the determinant of the bankruptcy law is known, and should not be correlated with corporate board structure. There are six bankruptcy reforms that have been comprehensively studied by the bankruptcy literature, namely, the 2012 reform in Germany, the 2005–2006 reforms in Italy, the 1979 reform in the US, the 2006 reform in Korea, the 2005 reform in Brazil, and the 2002 reform in India.[33] I study the reforms in Germany and Italy, as those are the only cases for which data availability of BoardEx allows for a meaningful analysis.[34] Additionally, I provide event-study evidence on the US reform using detailed summary statistics on board structure of US firms from 1933 to 2011 based on hand-collected data provided by Graham, Kim, and Leary (2020).

### 4.1 Germany's bankruptcy reform of 2012

As a response to the economic consequences of the 2007–2009 financial crisis, in 2012, Germany introduced a bankruptcy reform that was aimed at facilitating the restructuring of distressed firms (Canipek, Kind, and Wende, 2021).[35] In particular, the reform reduced managerial bankruptcy penalties by introducing a debtor-in-possession proceeding of about six months—accessible unilaterally, i.e., without creditors' consent—that allows management to

[32] The empirical strategy is similar to that used by Favara et al. (2017), who support their cross-country findings regarding the effect of bankruptcy law design on investments and risk taking by studying changes in these variables of risky firms relative to those of safe firms around bankruptcy reforms. For studies that use bankruptcy reforms to examine the effect of bankruptcy design on different firm characteristics, see, besides Favara et al. (2017), also, e.g., Vig (2013), Rodano, Serrano-Velarde, and Tarantino (2016), Canipek, Kind, and Wende (2021), and Schoenherr and Starmans (2022).

[33] As mentioned earlier, the studies in the bankruptcy literature are typically concerned with the effect of creditor rights on corporate financial and investment policy.

[34] As noted, BoardEx improved data coverage over the course of the 2000s (BoardEx started collecting data in 1999) and at different speeds across countries. For the year of the reform, board data (in combination with the control variables and Altman's Z-score) are available for only two firms in Brazil and no firms in Korea, India, and the US.

[35] The intention to reform the law initially dates back to the coalition agreement of 2009, and was originally based on the idea to compete with other restructuring laws, such as that of the US, that have been increasingly favored by investors in their investment decisions. However, ultimately no major changes have been made, until, in June 2010, an oppositional party submitted a letter of request demanding the government to implement a restructuring law in order to protect thousands of the by the 2007–2009 financial crisis distressed firms from inefficient liquidation by the old law. (Similarly, the 2020 bankruptcy reform in the UK initially originates from several proposals in 2016, and was actually based on the idea to compete with other restructuring laws; however, ultimately no major changes have been made, until the Covid-19 crisis and the economic consequences it generated brought the proposals back to the legislative agenda (Payne, 2021)). For my analysis, the most important point is that the determinant of the bankruptcy reform, be it the 2007–2009 financial crisis or to compete with other reorganization laws, should not be corelated with corporate board structure, or at least not differently across firms with high and low default probability. For the history of the reform, see Canipek, Kind, and Wende (2021).

stay in corporate control during the bankruptcy procedure and moreover imposes automatic stay on the assets.[3637] In terms of the creditor rights index, the reform removed the individual creditor rights components MANAGES, REORG, and AUTOSTAY (only secured creditors' right to be paid first is left unchanged), thus reducing Germany's creditor rights index by three points from four to one.[38] According to the cross-country results of Section 3, this is associated with an increase in the number of independent directors by approximately 26%, or 14% when measuring the effect by comparing firms with high and low default probability.

I examine changes in board independence of firms with high default probability relative to those of firms with low default probability around the bankruptcy reform. Relative to event-study evidence, this has the advantage that firms with low default probability serve as a control group that account for confounding factors common to all firms.[39] If debt governance matters, the expectation is that firms with high probability of default increased board independence after the reform relative to firms with low probability of default.

The data are the same as for the cross-country analysis, described in Section 2. The sample period is from 2007 to 2016, that is, I study five years before and after the enactment of the reform in 2011.[40] Based on the four-year average pre-reform (2008 to 2011) measure of default probability (Altman's Z-score), I divide firms into four quartiles and define firms in the highest quartile as high default probability firms and firms in the lowest quartile as low default probability firms.[41] The full sample with all quartiles consists of 221 firms. The final sample, i.e.,

[36] Similar to US Chapter 11, the law also offers the possibility of a cram down option that allows the court to impose a restructuring plan on dissenting creditors (Canipek, Kind, and Wende, 2021).

[37] Under the old law, management was significantly penalized in bankruptcy. In particular, immediately after filing for bankruptcy, management was dismissed, and corporate control was transferred to an administrator. Moreover, while the task of the administrator was to continue the firm until the voting date on which different classes of claimants voted on whether to continue or liquidate the firm (scheduled six months after filing), his/her overriding objective to protect secured creditors' security value together with the threat of contingent liabilities towards creditors when violating this objective essentially gave secured creditors the power to seize their assets during the bankruptcy procedure, which in turn led to firm liquidation. Empirically, 86% of bankrupt firms got liquidated before the voting date, i.e., by the administrator. Overall, bankrupt firms experienced a firm liquidation at the end of the bankruptcy procedure in about 89% of cases. For the pre-reform law in Germany, see Canipek, Kind, and Wende (2021).

[38] Empirically, Canipek, Kind, and Wende (2021) show that, in 2017, the acceptance rate when a firm filed for the debtor-in-possession proceeding was about 88%. Additionally, the continuation rate of firms that filed for a reorganization procedure was about 90%. These results document the empirical relevance of the changes introduced by the reform.

[39] Note that although the determinant of the reform should not be correlated with corporate board structure, another advantage of comparing high and low default probability firms is that, to affect the results, the reform's determinant not only needs to be correlated with board independence, but also needs to affect board independence to a different extent for firms with high and low default probability.

[40] The reform was passed in 2011, and became effective in 2012. For details on the timing of the reform, see Canipek, Kind, and Wende (2021).

[41] I use the four-year pre-reform average (2008 to 2011) of default probability, and not, e.g., the five-year pre-reform average, to remain consistent with the analysis of the Italian reforms for which I use the four-year pre-reforms average from 2002 to 2005, with 2002 being the first year of the sample period.

when only considering firms in the highest and lowest quartiles, consists of 778 firm-year observations from 110 firms (55 firms with high default probability and 55 firms with low default probability). Table A.4 in the Appendix reports summary statistics, separately for firms with high and low default probability, and for the periods before and after the reform.

To test for the expected effect, I estimate the following difference-in-differences regression:

$$Dependent\ variable_{it} = \alpha_i + \lambda_t + \eta Post_t + \gamma HighRisk_i + \delta(Post_t\ x\ HighRisk_i) + \boldsymbol{\beta X}_{it} + \varepsilon_{it}, \quad (2)$$

where the dependent variable is one of the board variables of interest (either log independents, ratio of independents to board size, or log board size); $i$ indexes firms, and $t$ indexes time; $\alpha_i$ are firm fixed effects that control for time-invariant differences across firms; $\lambda_t$ are year fixed effects that control for time-varying factors that are common to all firms; $Post_t$ is an indicator variable that equals one for the years after the bankruptcy reform was passed (2012 to 2016), and zero for the years before the reform was passed (2007 to 2011); $HighRisk_i$ is an indicator variable that equals one for firms with high default probability (highest quartile of the bankruptcy probability distribution), and zero for firms with low default probability (lowest quartile); $\boldsymbol{X}_{it}$ are the same time-varying firm characteristics as in the cross-country analysis;[42] $\varepsilon_{it}$ is the firm-specific error term; and $\delta$ is the coefficient of interest, which measures the change in the board variable of firms with high default probability after the reform relative to firms with low default probability (the difference-in-differences effect). I cluster standard errors at the firm level, as corporate board structure should be correlated over time within a firm (see Section 2.2 above).[43]

Columns 1 and 2 of Table 4 report the results for the logarithm of the number of independent directors as the primary measure of the board's governance strength. Consistent with the cross-country results, columns 1 (without controls) and 2 (with controls) show that the coefficient on $Post_t\ x\ HighRisk_i$ is positive and statistically significant, i.e., firms with high default probability increased the number of independents after the reform relative to firms with low default probability. Also the economic effect is consistent with that of the cross-country analysis. Column 2 shows that, relative to firms with low default probability, firms with high default

[42] Note that, compared to the cross-country analysis, return volatility drops out as a control variable, given that it is defined as the average standard deviation of return on assets across all years and thus does not vary over time.

[43] The difference-in-differences specification follows that employed by Vig (2013) and Favara et al. (2017).

probability increased the number of independent directors by 29% after the reform (which implies an increase of 0.29 x 1.8 = 0.5 independents, calculated by the full sample average of the number of independents of high default probability firms, see Table A.4).

In columns 3 and 4, I present the estimates for the ratio of independents to board size as an alternative measure of the governance strength by the board. As shown, the findings are (qualitatively) similar. Column 4 shows that firms with high default probability increased the ratio by 8 percentage points relative to firms with low default probability. Finally, columns 5 and 6 present the estimates for the logarithm of board size as the outcome variable. As can be seen, firms with high default probability did not change board size after the reform relative to firms with low default probability, which is again consistent with the cross-country analysis and suggests that independents replaced dependents instead of being added to the board.

As mentioned, comparing high and low default probability firms has the advantage of a control group in firms with low default probability that account for confounding factors common to all firms. Yet, a potential concern with my results is that a confounding factor affected high and low default probability firms differently. Before proceeding, recall that board structure is sticky.[44] That is, board structure is determined by static variables that typically do not change over time, which already mitigates the concern of possible confounding shocks.

To further mitigate the concern of confounding events, in Figure 1, I plot changes in the number of independent directors for firms with high and low default probability over time (for an extended period from 2002–2017 to get a broader picture). Specifically, Panel A shows the time series of the average number of independent directors for high and low default probability firms. As can be seen, high default probability firms increased the number of independents relative to low default probability firms after the reform. In contrast, high and low default probability firms followed parallel trends in the number of independents several years before the reform, suggesting that both groups of firms generally experience similar shocks and thus would have followed the same trend in the absence of the reform. To examine the statistical significance of possible changes, Panel B plots the yearly differences in the number of independent directors between high and low default probability firms relative to the difference in the year prior to the reform, 2011.[45] As shown, for the years after the reform, the point estimates are positive and statistically significant, implying that the number of independents of firms with high default probability increased relative to firms with low default probability after 2011. In contrast, for the years before the reform, the point estimates are statistically insignificant,

[44] As shown in Section 2.2, firms change the number of independents on average only about every 2.7 years, and, if a change takes place, typically only one independent director is added to or removed from the board.

[45] The empirical method here follows that used by Favara et al. (2017) and Jensen and Johannesen (2017).

implying that the difference in the number of independents between high and low default probability firms was not different to that of 2011.

Notably, adjustments in boards were made over a number of years after the reform. This is consistent with the fact that specific dates of the annual shareholders' meeting (on which directors are typically replaced), staggered board provisions, or existing contracts can lead to lags in replacing directors as well as to changes in directors at different points in time across firms.[46][47]

For robustness, Figure A.1 in the Appendix repeats the analysis of Figure 1 for the ratio of independents to board size as well as for board size. As can be seen, all findings are supported, i.e., risky firms did not change board structure or board size relative to safe firms prior to the reform.

### 4.2 The 2005–2006 bankruptcy reforms of Italy

Prompted by the Parmalat scandal, one of the largest European corporate bankruptcies, the Italian government introduced the 2005 and 2006 bankruptcy law reforms (Rodano, Serrano-Velarde, and Tarantino, 2016).[48] The 2005 reform, aimed at rescuing the firm, was designed to facilitate firm continuation and reduced bankruptcy penalties by allowing debtors to enter a reorganization procedure unilaterally, thereby removing strict credit reimbursement requirements that previously applied (prior to the reform, debtor's plan had to provide the full repayment of secured creditors' claims along with at least 40% of unsecured creditors' claims).[49] Afterwards, the 2006 reform increased bankruptcy penalties by introducing several changes to the liquidation procedure that speeded up the previously lengthy process of firm liquidations (which, due to higher expected recovery rates, increases creditors' incentives to press for liquidation).[50] Empirically, Rodano, Serrano-Velarde, and Tarantino (2016) show that the share of

[46] On possible lags in replacing directors, see also Ferreira, Ferreira, and Mariano (2018).

[47] The figures presented in this section graphically reflect the first two facts of the summary statistics discussed in Section 2.2 above. Taken together, the figures show that (i) there is an independence gap across countries, (ii) the independence gap persists over time, (iii) there is a general trend towards more independent boards, and (iv) the independence gap seems to be related to creditor rights (e.g., Germany has low board independence with pre-reform CRIGHTS=3, Italy has medium to high board independence with pre-reform CRIGHTS=2, other countries (including Austria, Belgium, France, Netherlands, and Switzerland) have medium to high board independence with average CRIGHTS=1.8, and the US has high board independence with CRIGHTS=1). Additionally, the figures show that there is little within-firm variation in board independence around the trend component (it seems that not even the 2007–2009 financial crisis led to major changes in board independence).

[48] Parmalat was an Italian dairy and food company. At the end of 2003, the firm collapsed with total assets of about 20 billion dollars. To rescue the firm without violating European regulations on government bailouts, the Italian government introduced the 2005 reform (Rodano, Serrano-Velarde, and Tarantino, 2016).

[49] Following US Chapter 11, the 2005 reform also introduced other changes that additionally reduced bankruptcy penalties. In particular, the reform lowered the share of votes (from two-thirds to one-half) required for a reorganization plan to be accepted. Furthermore, the reform introduced a cram down option that allows the court to impose a reorganization plan despite objections from creditors (Rodano, Serrano-Velarde, and Tarantino, 2016).

[50] In Italy, a liquidation procedure is in general carried out by a court-appointed trustee. Prior to the reform, the combined effect of poor trustee incentives to speed up liquidation—the trustee's salary was independent of

reorganization procedures increased from about 2% before 2005 to about 10% in 2009. Additionally, the share of liquidation procedures that lasted longer than 24 months decreased from about 95% before 2005 to about 60% after 2005. With regard to the creditor rights index, while the first reform eliminated the individual component REORG (and partly eliminated MANAGES and AUTOSTAY through facilitating access to the protected reorganization procedure under management), the second reform affected the component SECURED (by higher expected recovery rates in liquidation).

As for the reform in Germany, I study changes in board independence of firms with high default probability relative to those of firms with low default probability around the reforms. If debt governance matters, we should see that, relative to firms with low probability of default, firms with high probability of default increased board independence after the 2005 reform, and decreased board independence after the 2006 reform. The data are the same as for the cross-country study. The sample period is from 2002 to 2011 to study the ten years around the 2005–2006 reforms. For both reforms, based on the four-year average measure of default probability prior to the first reform (2002 to 2005) (thus, comparing the same set of firms over time), I divide firms into four quartiles and define high default probability firms as firms in the highest quartile of the bankruptcy probability distribution and low default probability firms as firms in the lowest quartile. The full sample consists of 53 firms, while the final sample, i.e., when only considering firms in the highest and lowest quartiles, consists of 217 firm-year observations from 27 firms (14 firms with high default probability and 13 firms with low default probability). Note that the sample size is relatively small, which is why the findings from Italy may be seen as supplementary evidence to the findings from Germany. Table A.6 in the Appendix reports summary statistics, separately for firms with high and low default probability, and for the periods before and after the reforms.

I test for the expected effects employing the difference-in-differences regression of equation (2) to each reform. For the 2005 reform, $Post_t$ equals one for the year after the reform was passed (2006), and zero for the years before the reform was passed (2002 to 2005), that is, I compare changes in board structure after the first reform was passed, but before the second reform was passed. For the 2006 reform, $Post_t$ equals one for the years after the reform was passed (2007 to 2011), and zero for the year before the reform was passed (2006), that is, I

creditors' recovery rates or the duration of the procedure—and the lack of creditor rights to monitor the trustee—creditors could neither veto the trustee's decisions nor ask for the trustee to be replaced—made liquidations a lengthy affair. In contrast, the new law allows creditors to ask for the trustee to be replaced and moreover makes all trustee decisions dependent on their approval. As a result, creditors effectively gain control over the liquidation procedure, who, in order to preserve asset value, are typically interested in speeding up liquidation. For the pre-reform law in Italy, again see Rodano, Serrano-Velarde, and Tarantino (2016).

compare changes in board structure after the second reform relative to the year after the first reform.

Panels A and B of Table 5 respectively show the results for the 2005 and 2006 reforms. Confirming the cross-country findings, columns 1 and 2 show that firms with high default probability increased (decreased) the number of independent directors relative to firms with low probability of default after the 2005 (2006) reform. Also the economic effects are similar to those found in the cross-country analysis. Columns 3 and 4 present the results for the ratio of independents to board size as the outcome variable and support the findings. Finally, columns 5 and 6 show that firms with high default probability did not change board size relative to low default probability firms after the reforms.

As for the reform in Germany, Figure 2 shows changes in the number of independent directors for firms with high and low default probability over time. Most importantly, while high default probability firms changed the number of independents relative to low default probability firms after the reforms, they did not change board independence relative low default probability firms prior to the reforms. This is consistent with the assumption that both groups of firms would have followed the same trend without the reforms.[51]

### 4.3 US Bankruptcy Reform Act of 1978

Probably the most prominent bankruptcy reform is the US Bankruptcy Reform Act of 1978, which became effective in October 1979. While the process of the reform was triggered by increasing dissatisfaction with the bankruptcy law (the law was considered unnecessarily complicated and intolerably ambiguous), the final outcome reflected the relative political power of competing interest groups, such as debtors, managers, creditors, lawyers, judges, and politicians. Ultimately, the reformation process resulted in a law that was designed to facilitate debt

[51] As a response to corporate scandals such as the Parmalat scandal, and following worldwide board reforms aimed at improving corporate governance, simultaneously to the bankruptcy reforms, the Italian government passed board reforms in 2006 that require and encourage a certain level of board independence (Kim and Lu, 2013; Fauver et al., 2017). In particular, the board reforms in Italy require that firms have at least one independent director and furthermore encourage firms to form remuneration and control committees that are made up with a majority of independents, that is, recommending at least two independents. For my empirical analysis, the most important point here is that the findings should not be affected by the board reforms, given that the reforms apply to all firms, while I study changes in board structure of high default probability firms relative to those of low default probability firms (low default probability firms serve as a control group). A potential concern might be that the board reforms affected high and low default probability firms disproportionally, i.e., that the reforms were binding for one of the groups of firms, while they were not binding for the other group. However, note that in the year of the reforms, 2006, almost all of the sample firms had at least 2 independents (more precisely, only one firm had only one independent director), suggesting that the reforms were not binding for any of the considered groups. Finally, note that while the board reforms were aimed at increasing board independence, the bankruptcy reform of 2006 leads to the expectation that firms decrease board independence, suggesting that, if anything, the board reforms actually downward bias the results.

renegotiation in bankruptcy (Posner, 1997; Hackbarth, Haselmann, and Schoenherr, 2015; Favara et al., 2017).

In particular, the reform made three major changes to debtor-in-possession reorganization under Chapter 11 (Hackbarth, Haselmann, and Schoenherr, 2015; Favara et al., 2017). First, it reduced the share of votes that are required for a reorganization plan to be accepted. Second, it introduced a cram down option that allows the court to impose reorganization if a plan cannot be agreed. Third, it lowered the conditions under which firms can voluntarily file for Chapter 11, i.e., the new law does not require a firm to be insolvent to file for reorganization (which may enable distressed firms to get rid of debt obligations by strategically filing for Chapter 11, or to use the threat of voluntary Chapter 11 filing to achieve concessions, such as debt relief or less covenant restrictions, from creditors outside of bankruptcy[52]). Overall, the reform reduced liquidation risk in distress by shifting bargaining power in reorganization to debtors, thereby reducing managerial bankruptcy penalties.

While data limitations of conventional board databases such as BoardEx prevent a more refined analysis of the reform, based on hand-collected data, among others (e.g., Hermalin and Weisbach, 1988; Lehn, Patro, and Zhao, 2009), Graham, Kim, and Leary (2020) provide detailed information on annual means of board structure of US firms around the reform that allow for event-study evidence. For the period 1920 to 2011, the database of the authors contains about 87,000 firm-year observations of NYSE/AMEX firms, largely hand-collected from Moody's Industrial Manuals.

Figure 3, which is a copy of Panel C of Figure 1 from Graham, Kim, and Leary (2020), shows average board structure from 1933 to 2011 (blue solid line). Additionally, the figure shows average regression residuals after controlling for several firm characteristics, including firm age, board size, book assets, Tobin's Q, industry-adjusted return on assets, and asset tangibility (red dashed line). Consistent with the previous findings, and as described by the authors, "Board independence was stable at about 50% for four decades starting in the 1930s (. … ) [while] From the late 1970s to mid-1990s, average board independence increased to around 60%." (p. 618).[53] Note that the large sample size suggests that the observed changes are statistically significant. Importantly, and to put this matter differently, the analysis here not only provides further support on the empirical relevance of debt governance, but also provides a

[52] See Benmelech and Bergman (2008), who show that firms are able to renegotiate their contracted obligations downward outside of bankruptcy states when liquidation values are low.

[53] Likewise, Hermalin and Weisbach (1988, p. 593) find in their sample: "Board composition has changed through time. A striking feature of our data is that between 1971 and 1983 there has been a substantial movement toward replacing insiders with outsiders. The average percentage of outsiders rose from 37.6% to 53.9%, while the average percentage of insiders fell from 49.1% to 34.3%."

natural explanation for the increase of independent directors in the US between the 1970s and 1990s, a puzzle that is often documented and discussed in the board literature but remains largely unresolved to this date.[54][55]

### 4.4 Changes in board structure of firms in other countries

As noted, a potential concern with my results is that a confounding shock affected high and low default probability firms differently. The sticky feature of board structure, and the parallel trends between high and low default probability firms prior to the reform already mitigate this concern. In this subsection, I study changes in board structure of firms in other countries. Specifically, I examine whether in other countries firms with high default probability have changed board independence relative to firms with low default probability around the reforms in Germany and Italy. This analysis further addresses the concern of confounding events by controlling for the set of possible confounding shocks commonly experienced by all countries, such as economic crises or worldwide trends in corporate governance.

As control countries, I consider a group of countries that are similar to Germany and Italy in terms of economic and financial development. These countries include Austria, Belgium, France, Netherlands, and Switzerland.[56] Additionally, I also present the results for the US, which might be seen as the benchmark case for international shocks and trends on board independence. The empirical analysis is the same as for Germany and Italy. Specifically, for each of the control countries, I divide firms into four quartiles (based on the average Z-score from 2008–2011 regarding the German reform and based on the average Z-score from 2002–2005 regarding the Italian reforms) and define firms in the highest quartile as risky firms and firms in the lowest quartile as safe firms, and study changes in board structure for the ten years around the reforms.

Panel A of Table 6 presents the results regarding Germany's reform. The number of independent directors is the dependent variable in columns 1 (similar countries) and 4 (US). As can be seen, in the similar countries, firms with high default probability did not increase the number of independents relative to firms with low default probability after the reform in 2011. The same

[54] For more on the puzzling rise of independents in the US, see, besides Hermalin and Weisbach (1988), also Gordon (2007).

[55] Note that while changes in board structure until the mid-90s may be caused by the bankruptcy reform, changes thereafter may be caused by other factors, such as international trends in corporate governance (Ferreira and Kirchmaier, 2013; Fauver et al., 2017) or NYSE/Nasdaq amendments and the Sarbanes-Oxley Act that both required and encouraged firms to increase board independence (Graham, Kim, and Leary, 2020).

[56] For Italy, Spain might be an additional option for a country with similar macroeconomic characteristics. For Germany, Nordic countries (including Denmark, Finland, Norway, and Sweden) might have similar macroeconomic characteristics. In unreported results, I include Spain and Nordic countries as control countries to the analyses of the German and Italian reforms and obtain similar results.

applies for the US. Columns 2 and 5 show that the findings are similar when using the ratio of independents to board size as the outcome variable. Finally, columns 3 and 6 show that firms with high default probability did not exhibit changes in board size after the reform relative to firms with low default probability in the control countries. In Figure 4, I plot changes in the number of independent directors for high and low default probability firms of the control countries over time. As shown, there were no changes in the number of independents of firms with high default probability relative to firms with low default probability, both before and after the reform.

Panels B and C of Table 6 respectively report the results for the 2005 reform and 2006 reform in Italy. Most importantly, in the similar countries and in the US, firms with high default probability did not change the number of independents relative to firms with low default probability after the reforms in 2005 and 2006. Figure 5 shows that high and low default probability firms exhibited parallel trends in the number of independents, both before as well as after the reforms.[57]

Overall, the results suggest that the findings in Germany and Italy are not affected by confounding shocks that were common to all countries. Ultimately, the results suggest that, to affect one of the difference-in-differences analyses, confounding events not only needed to have different effects on high and low default probability firms, but also needed to be country-specific. Note that such a country-specific shock appears unlikely, given that in all countries high and low default probability firms followed the same trend.

## 5 Alternative explanations and additional discussions

In the previous sections, I find a negative relation between board independence and bankruptcy penalties, and especially so for firms with high default probability. The results suggest that firms implement independent directors as a substitute when bankruptcy legislations that are soft on management make debt governance ineffective, thus providing empirical support on debt governance. In this section, I study the robustness of my findings to alternative explanations. Additionally, I provide some discussions that may be helpful in gaining further insights into the findings of this paper.

[57] In unreported results, I also directly compare changes in board independence of German and Italian firms to those of firms from other countries. Specifically, I compare risky firms from Germany and Italy to all firms from other countries as well as safe firms from Germany and Italy to all firms from other countries. I find that board independence of risky German and Italian firms increased (decreased) after the reforms relative to firms from other countries. In contrast, board independence of safe German and Italian firms in general did not change after the reforms relative to firms from other countries. Notably, also on average, i.e., when considering all firms, German and Italian firms changed board independence after the reforms relative to firms from other countries, implying changes in the independence gap across countries.

## 5.1 Alternative explanations

### 5.1.1 Recovery rates of creditors

At a first sight, a concern with my findings might be that the negative relation between board independence and creditor rights may not be driven by the fact that firms implement independents as a substitute when the absence of bankruptcy penalties makes debt governance ineffective, but may be driven by an alternative explanation that is based on creditors' recovery rates. Specifically, it might be that because creditors expect lower recovery rates when their rights in bankruptcy are weak, they demand independent directors in order to improve management quality and to thereby reduce the probability of default. Management, in turn, agrees to such a demand to raise capital by low credit costs.[58]

A closer examination, however, suggests that this alternative story is unlikely to be relevant in my setting. From a theoretical perspective, there are at least two reasons for this. First, note that in each of the two bankruptcy regimes, i.e., creditor- or debtor-friendly, or, put differently, high or low recovery rates, management may bond itself to the optimal amount of independents (the amount after which an additional independent brings no more additional value on management quality and thus has no effect on credit costs) to ensure financing by low credit costs. In other words, in both regimes, i.e., regardless of creditors' recovery rates, management adds the same number of independents, since for both regimes this is the optimal amount of governance pressure and thus allows for the maximum amount of capital. The only reason why a shift from a creditor-friendly to a debtor-friendly regime may motivate management to increase independents is when such a shift changes the value of corporate governance, which is not given in the "recovery rates story", but central in the "governance substitution story" (additional independents restore management discipline that was previously accomplished by debt governance). Second, John and Litov (2010) argue that while good corporate governance may be desirable for stockholders by aligning the interests of managers with those of equityholders, it might be harmful for creditors by encouraging value-enhancing risk taking that leaves them with downside risk. As such, creditors may actually not be interested in good governance, but in contrast may consider a firm with weak governance as being less risky and hence provide better terms for debt financing.[59]

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[58] See, e.g., Davydenko and Franks (2008), Brockman and Unlu (2009), Vig (2013), and Rodano, Serrano-Velarde, and Tarantino (2016) for a discussion of lower recovery rates of creditors when creditor rights are weak. See Brockman and Unlu (2009), who argue that creditors may demand and managers agree to more restrictive firm policies, such as lower dividend payouts, when creditor rights are weak in order to reduce the potential losses of granting a loan and the costs of credit.

[59] Empirically, John and Litov (2010) find a positive the relationship between weak corporate governance and leverage, consistent with their hypothesis that entrenched managers receiving better access to debt financing as a response to a more conservative investment policy that is aligned with creditors' interests (on this, see also Ji,

Besides the theoretical inconsistencies, there are several pieces of empirical evidence that are inconsistent with the recovery rates story, while being consistent with the governance substitution story. First, if the recovery rates story applies, we should see that the negative relation between board independence and the individual components of the creditor rights index is strongest for the provision that determines whether secured creditors are paid out first after the bankruptcy procedure (SECURED), as a direct proxy for creditors' expected recovery rates in bankruptcy. In contrast, as shown in Tables 2 and 3 in Section 3, the effects are weakest for this provision, while being strongest for provisions that imply strong management penalties in default (MANAGES, AUTOSTAY, REORG).

Second, while both stories have the same prediction of a negative relation between board independence and bankruptcy penalties, they have mutually exclusive predictions on the relation between leverage and board independence. The governance substitution story predicts that higher leverage reduces board independence (for levered firms, debt governance matters). In contrast, the recovery rates story predicts that higher leverage increases board independence (for levered firms, banks demand more independent directors to avoid default). Table 2 in Section 3.1 shows the relation between leverage and board independence. As shown, an increase in leverage is related to a reduction in board independence. This result is inconsistent with the recovery rates story, while being consistent with the governance substitution story.[60]

Third, in ongoing research, Canipek (2023) studies the relation between agency problems and bankruptcy penalties, and finds that agency problems are negatively related to bankruptcy penalties. This finding is consistent with the governance substitution story, which is based on the notion that debt governance mitigates agency problems. In contrast, the recovery rates story cannot explain the negative relation. In fact, the recovery rates story predicts a positive relation between agency problems and bankruptcy penalties, as stronger creditor rights reduce creditors' demand for good corporate governance.

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Mauer, and Zhang, 2020). Additionally, Bradley and Chen (2015) find that board independence can increase the cost of debt and that independent directors typically set corporate policies that increase firm risk. The authors argue that their findings suggest that independent directors act in the interest of shareholders and are costly to bondholders with the intensification of agency problems between these two stakeholder groups.

[60] Similar to this, in unreported results, I find that an increase in default probability (based on Altman's Z-score) is related to a reduction in board independence, and only so in countries with high creditor rights (see also Maier and Yurtoglu, 2022, who find a negative relation between bankruptcy risk and board independence). This result is consistent with the governance substitution story, which predicts that higher default probability decreases board independence, and only so in countries with strict management penalties (when debt governance is effective). The result cannot be explained by the recovery rates story, which can only explain a positive relation between bankruptcy risk and board independence but not a negative one.

5.1.2 Changes in other firm characteristics

Another alternative explanation for the negative relation is possible changes in other firm characteristics. The bankruptcy literature suggests that creditor rights can change credit costs and distress costs (Acharya, Amihud, and Litov, 2011; Vig, 2013; Rodano, Serrano-Velarde, and Tarantino, 2016; Mann, 2018; Canipek, Kind, and Wende, 2021; Schoenherr and Starmans, 2022). Such changes may affect important firm characteristics, such as corporate leverage, investments, risk taking, or profitability, which in turn may affect board structure. However, it is important to note that this concern is mitigated by the fact that I control for a long list of firm characteristics that have been found to be affected by creditor rights, and that have been shown to be possible determinants of board structure. Additionally, it should be noted that the economic significance of the effects of important firm characteristics on board independence is low in essentially all regressions in the board literature (Ferreira, Ferreira, and Mariano, 2018). For example, Boone et al. (2007) and Ferreira, Ferreira, and Raposo (2011) show that a one-standard-deviation change in firm size, number of business segments, and corporate leverage is related to a 1.8, 1.3, and 1.2 percentage point change in board independence, respectively. This suggests that possible changes in firm characteristics should not explain the observed large economic effect between board structure and creditor rights.[61]

**5.2 Additional discussions**

5.2.1 Governance role of bankruptcy penalties at earlier levels

Bankruptcy penalties may not only present the lower point of managerial inefficiency, but may also play a governance role at earlier levels (Hart and Moore, 1995; Hart, 2001, 2017). As mentioned in the Introduction, besides the threat of bankruptcy penalties, there are also other mechanisms through which debt can induce an incentive effect on management quality such as forcing management to disgorge free cash flow that might otherwise have been used for making unprofitable empire building investments (Jensen, 1986; Stulz, 1990; Hart and Moore, 1995) or the threat of managerial restrictions on financial and investment policy following covenant violation (Chava and Roberts, 2008; Nini, Smith, and Sufi, 2009, 2012; Roberts and Sufi, 2009a, 2009b; Roberts, 2015; Bharath and Hertzel, 2019). Importantly, while bankruptcy risk is not necessary to validate the incentive effect of these mechanisms, bankruptcy penalties may be important by making them more effective. For example, Hart and Moore (1995) emphasis that it is actually "hard" debt that curbs overinvestment by its nonpostponable nature such that

[61] Also note that there is no obvious reason how possible changes in the firm characteristics should explain the negative relation between agency problems and creditor rights found by Canipek (2023).

obligations are effectively enforced when they are due. Similarly, bankruptcy law should be the starting point in the renegotiations following a covenant violation by determining the bargaining power between creditors and managers. Whereas creditor-friendly bankruptcy procedures give creditors a credible threat (by high liquidation values for creditors and high bankruptcy costs for management) to put the firm into bankruptcy when denying the demanded amendments, more management-friendly laws improve managers' bargaining position (in fact, management can default strategically, with automatic stay provisions preventing foreclosures and lowering creditors' liquidation value) and thus reduce the extent of new restrictions that creditors can renegotiate.[62]

Note that the possibility that bankruptcy penalties induce an incentive effect at earlier levels provides a natural explanation for the negative relation between board independence and bankruptcy penalties among safe firms documented in Section 3.2 (at least for the full sample). Additionally, note that, provided that governance by covenants or by the limitation of funds affects risky and safe firms equally,[63] one might interpret the difference in the negative relation between board independence and bankruptcy penalties across risky and safe firms as the result of the direct incentive effect that managerial bankruptcy penalties have on management quality (for which default risk is relevant), while the negative relation among safe firms might be interpreted as the result of the indirect incentive effect that managerial bankruptcy penalties produce by making the other mechanisms (for which default risk is not relevant) more effective.

### 5.2.2 Relevance of bankruptcy penalties in the presence of covenants

From a theoretical perspective, a large volume of studies shows that the threat of bankruptcy penalties can mitigate agency problems. Yet, a concern with these theories might be whether debt governance is practically relevant in the presence of covenants. As outlined,

[62] For renegotiation-based incomplete contracting models predicting that liquidation values affect renegotiation and determine the bargaining power between creditors and debtors, see Berglöf and von Thadden (1994), Bolton and Scharfstein (1996), Hart and Moore (1998), and Benmelech and Bergman (2008). Empirically, Benmelech and Bergman (2008) show that firms can renegotiate their contracted obligations downward (in and outside of bankruptcy states) when liquidation values are low. In addition, Davydenko and Franks (2008) show that recovery rates of secured creditors are positively correlated with their rights in bankruptcy. Specifically, the recovery rates in the UK (CRIGHTS=4), Germany (3), and France (0) are 94%, 72%, and 57%, respectively.

[63] It seems unclear whether governance by covenants or by the limitation of funds affects risky and safe firms equally or differently. For example, on the one hand, governance through covenants may be particularly relevant for risky firms because here violations may occur more often or banks may be more interested to intervene and thus press for tighter restrictions after violations. However, on the other hand, Billett, King, and Mauer (2007) find that covenant protection is less present in risky firms (consistent with the notion that covenants restricting financing flexibility are especially costly for risky firms, as risky firms may need to borrow additional funds and/or restructure existing liabilities to survive), suggesting that the governance role of covenants may be more relevant for safe firms.

covenant violations can trigger tighter restrictions on corporate financial and investment policy.[64] As a result, covenants can serve as an upstream disciplining mechanism in comparison to debt governance, possibly making the incentive effect of debt governance irrelevant.

However, bankruptcy law should be critical for at least two reasons. First, while covenant violations may put restrictions on management regarding financial and investment decisions and thus may give management incentives to avoid violation, they virtually never lead to firm liquidation or management dismissal. For example, Nini, Smith, and Sufi (2012) show that only about 1% of violations are associated with a resolution by bankruptcy and/or liquidation. Additionally, they show that, despite violating firms exhibit several quarters of declines in operating performance and market valuation before violation, the probability of a forced CEO turnover is only about 1.5% during the four quarters before the violation and only about 2.5% during the four quarters after the violation.[65] The threat of management dismissal and firm liquidation should present the most dominant incentive effect on management to perform (Hart, 1995), and should not be made irrelevant by possible restrictions after covenant violation.

Second, as noted above, bankruptcy law may not only define the lower point of managerial inefficiency, but may also affect management at earlier levels by influencing the effectiveness of covenants and other governance mechanisms for which default risk is not necessary to discipline management. Overall, whether the governance role of bankruptcy penalties is practically relevant or not is ultimately an empirical question. Addressing this question is the main goal of this paper.

### 5.2.3 Endogeneity of corporate governance structure

In studying the interaction between alternative governance mechanisms, my study follows the notion that governance mechanisms are endogenously determined within the broader system of a firm's governance structure. That is, firms substitute between different governance mechanisms in forming an optimal governance structure in which the demand for one governance mechanism depends on the strength of alternative governance mechanisms (Demsetz and Lehn, 1985; Hermalin and Weisbach, 2003, 2012; Adams, Hermalin, and Weisbach, 2010;

[64] Note that in case of covenant violation, firms are typically not unable to repay the loan (Nini, Smith, and Sufi, 2012). Also note that there are a number of different scenarios that may occur when a firm violates a covenant. For example, the firm just repays the loan (and may take out a new loan), creditors allow a covenant waiver, creditors impose tighter constraints, or bankruptcy is declared (either strategically if the firm is able to repay the loan but wants to get rid of obligations or forced if the firm is unable to repay the loan).

[65] Nini, Smith, and Sufi (2012) show that whereas changes in the investment and financing behavior of violators coincide with the renegotiated credit agreements that include stricter restrictions, changes in the management of violators can occur by informal influence, e.g., creditors suggest actions to the board that can be made to increase the probability of receiving a covenant waiver.

Avedian, Cronqvist, and Weidenmier, 2015; Bharath and Hertzel, 2019).[66] Two points are worth noting in this context. First, in contrast to the endogeneity theory, it might be that board independence and debt governance are complements rather than substitutes (see, e.g., Doidge, Karolyi, and Stulz, 2007; Aggarwal et al., 2009, who argue that some governance mechanisms, such as strong legal enforcement, may complement others). However, there is no obvious reason why this should be the case. For board independence to induce discipline, debt governance is not needed. Likewise, for debt governance to be effective, board independence is not needed. Additionally, note that both stories have mutually exclusive predictions, suggesting that if board independence and debt governance are compliments, we should actually see a positive relation between them and not a negative relation. Second, endogeneity of corporate governance structure suggests that the hypothesis that debt mitigates agency problems cannot be rejected if there is no negative relation between board independence and bankruptcy penalties, given that firms may have substituted debt governance with other governance mechanisms than independent directors, such as incentive compensation, takeover provisions, or outside block-holding. Conversely, the finding that firms implement independent directors when debt governance becomes ineffective presents a strong case that debt is valued as a governance device.

### 5.2.4 Debt governance and firm value as an outcome variable

I evaluate the empirical relevance of debt to mitigate agency problems by studying the relation between debt governance and board independence, and not the relation between debt governance and firm value. Most studies evaluate the empirical relevance of a governance mechanism by looking at changes in the firm value, given that potential changes in agency problems should be reflected in the valuation of the firm (e.g., Harvey, Lins, and Roper, 2004; Fauver et al., 2017). However, in the setting of debt governance this approach is not very meaningful. The reason is that bankruptcy law not only affects the effectivity of debt governance, but may also affect credit costs and distress costs.[67] As a result, possible changes in the firm

[66] For studies that provide empirical evidence consistent with the idea that firms substitute between independent boards and alternative governance mechanisms, see, e.g., Ferreira, Ferreira, and Raposo (2011), who support the governance role of stock price informativeness by finding a substitution effect between price informativeness and board independence; Gillan, Hartzell, and Starks (2006), who find that board independence can be a substitute for the market for corporate control; and Coles, Lemmon, and Wang (2008), who report a negative relation between board independence and equity-based compensation. For empirical evidence consistent with a substitution effect among various other governance mechanisms, see, e.g., La Porta et al. (1998), who find that companies in countries with poor shareholder protection have more concentrated ownership; Bharath and Hertzel (2019), who provide evidence that ex post creditor governance by bank borrowing can substitute for pressure from the takeover market and product market; and Giroud and Mueller (2010), who find a substitution effect between competition and the takeover market.

[67] As suggested by the bankruptcy literature (Acharya, Amihud, and Litov, 2011; Vig, 2013; Rodano, Serrano-Velarde, and Tarantino, 2016; Mann, 2018; Canipek, Kind, and Wende, 2021; Schoenherr and Starmans, 2022), stronger creditor rights can reduce credit costs through higher collateral value and thus may increase firm

value may not come through a change in debt governance, but may come through changes in the other two variables. Studying the relation of debt governance to board independence gets around this problem, and largely mitigates the problem of alternative stories (see above).

## 6 Conclusions

A large body of theoretical research suggests that debt can mitigate agency problems. Yet, empirical evidence is limited due to identification problems. In this paper, I attempt to provide evidence. To do so, I examine whether firms implement independent directors as a substitute when debt governance becomes ineffective. Key to my analysis are two central features of debt as a governance device. First, it is only effective with bankruptcy penalties, second, it only matters for firms close to default (Grossman and Hart, 1982; Aghion, Hart, and Moore, 1992; Hart, 1995, 2000, 2001; Zwiebel, 1996). Consistent with debt inducing discipline, across countries, board independence is negatively related to bankruptcy penalties, and especially so among firms with high default probability. For these firms, a change from strictest to softest penalties is associated with a 46% increase in the number of independent directors, suggesting that debt is valued as a powerful source of discipline. Comparing board independence of high and low default probability firms around bankruptcy reforms confirms the cross-country results.

My findings have many important implications. First, my findings emphasize the role of agency problems as an important determinant of corporate capital structure. While the notion that debt is implemented to solve agency problems is theoretically extensively established (e.g., Grossman and Hart, 1982; Zwiebel, 1996), empirical evidence is scarce. Although my analysis does not directly consider financing decisions, the documented importance of debt to mitigate agency problems suggests that this aspect plays an important role in firms' capital structure. Second, my findings can account for several unresolved issues in corporate governance. One example is that debt governance can help to understand the mixed empirical evidence on the effectivity of other governance mechanisms. Whereas improvements in corporate governance may have a positive effect for firms in which debt governance is unavailable (or samples in which such firms are more present), they may have no effect for firms in which debt governance already mitigates agency problems.[68] Another example is that debt governance can be key in

value by allowing firms to increase financing and investments. In contrast, stronger creditor rights can also increase distress costs and thus may reduce firm value by prompting firms to lower leverage and undertake risk-reducing but unprofitable investments.

[68] Similarly, Giroud and Mueller (2010, 2011) provide evidence that firms in noncompetitive industries benefit more from good governance relative to firms in competitive industries where competitive pressure already enforces discipline on managers. For the notion that improvements in corporate governance may have a different effect for firms with weak and strong governance, see, besides Giroud and Mueller (2010, 2011), Bertrand and Mullainathan (2003) and Nini, Smith, and Sufi (2012).

understanding the substantial cross-sectional variation in corporate governance structure. In my study, I find that debt governance can explain large parts of the variation in corporate board structure (e.g., my results can explain about 37% of the difference in board structure between the US and the UK, or provide an explanation for the increase of independent directors in the US between the 1970s and 1990s). It seems likely that debt governance also plays a similarly important role in shaping the use of other governance mechanisms, such as incentive compensation, corporate takeover provisions, or outside block-holding (see the theory on endogeneity of corporate governance structure). I look forward to seeing research on this.

Finally, and perhaps most important, my study has important implications for optimal bankruptcy design. In particular, my findings present empirical evidence consistent with the notion that bankruptcy law should preserve the governance function of debt by penalizing management adequately in bankruptcy states. A law that fails to do so, has the effect that management may have difficulties to credibly commit to forgo inefficient actions and thus to secure financing ex ante (Aghion, Hart, and Moore, 1992; Hart, 2000).[69] It is important to note that this aspect is not considered by the current bankruptcy literature. Moreover, it is worth noting that while my findings are important in general, they may be particularly relevant in the context of the recent crises during which many countries have significantly softened their bankruptcy law.

[69] As noted earlier, stronger creditor rights may also be costly by increasing distress costs and thus prompting firms to reduce financing (Acharya, Amihud, and Litov, 2011; Vig, 2013; Mann, 2018; Canipek, Kind, and Wende, 2021; Schoenherr and Starmans, 2022). However, note that a debtor-friendly law is not necessarily incompatible with the "debt governance channel". One possibility to account for the channel in a debtor-friendly law is by including provisions that make bankruptcy penalties contingent on managerial misconduct (which can be determined, for example, by the performance of comparable firms). Consistent with this, for some firm types, like unlisted large firms, the new debtor-friendly law in Korea stipulates that the incumbent management may not be allowed to stay in control during bankruptcy if insolvency was caused by material mismanagement (Park, 2008).

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# Tables and figures

**Table 1**

Summary statistics

This table presents summary statistics by country. The columns show: column 1, average of the number of independent directors; column 2, average of the within-firm absolute growth in the number of independent directors per year (e.g., the average firm increases the number of independent directors by 0.12 per year, i.e., by 1.2 over ten years); column 3, average of the within-firm number of changes in the number of independent directors per year (e.g., the average firm changes the number of independent directors 0.37 times per year, i.e., every 2.7 years); column 4, average of the within-firm standard deviation in the number of independent directors; column 5, average of the ratio of the number of independents to board size; column 6, average of the within-firm absolute growth in the ratio of the number of independents to board size per year; column 7, average of the within-firm number of changes in the ratio of the number of independents to board size per year; column 8, average of the within-firm standard deviation in the ratio of independents to board size; column 9, average of board size; column 10, creditor rights index; column 11, average of Altman's Z-score; column 12, average of the standard deviation of Altman's Z-score; column 13, number of observations; and column 14, number of firms. Refer to Table A.1 in the Appendix for variable definitions.

| | Number of independent directors | | | | Ratio of independents to board size | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Within-firm | | | | Within-firm | | | | | Altman's Z-score | | | |
| | Mean | Yearly growth | Yearly changes | SD | Mean | Yearly growth | Yearly changes | SD | Board size | Creditor rights | Mean | SD | Observations | Number of firms |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
| Argentina | 4.60 | 0.383 | 0.467 | 1.142 | 0.470 | 0.021 | 0.617 | 0.085 | 9.79 | 1 | 3.94 | 6.44 | 70 | 10 |
| Australia | 3.57 | 0.088 | 0.383 | 0.631 | 0.592 | 0.012 | 0.514 | 0.088 | 5.92 | 3 | 6.50 | 11.31 | 4,146 | 670 |
| Austria | 6.54 | 0.137 | 0.309 | 0.954 | 0.487 | 0.012 | 0.465 | 0.075 | 12.71 | 3 | 2.93 | 2.44 | 292 | 36 |
| Belgium | 4.05 | 0.030 | 0.340 | 0.704 | 0.445 | 0.007 | 0.515 | 0.078 | 9.32 | 2 | 3.68 | 5.28 | 668 | 76 |
| Brazil | 2.99 | 0.085 | 0.378 | 0.781 | 0.378 | 0.013 | 0.558 | 0.086 | 8.21 | 1 | 2.46 | 3.23 | 512 | 89 |
| Canada | 6.09 | 0.102 | 0.447 | 0.732 | 0.727 | 0.011 | 0.528 | 0.059 | 8.30 | 1 | 3.01 | 6.46 | 4,084 | 657 |
| Chile | 2.10 | -0.036 | 0.270 | 0.373 | 0.266 | -0.005 | 0.387 | 0.050 | 8.07 | 2 | 2.43 | 1.11 | 131 | 20 |
| China | 3.57 | -0.006 | 0.152 | 0.273 | 0.442 | 0.003 | 0.333 | 0.034 | 8.52 | 2 | 3.31 | 3.96 | 1,162 | 193 |
| Colombia | 4.20 | 0.243 | 0.514 | 0.709 | 0.552 | 0.026 | 0.486 | 0.071 | 7.63 | 0 | 2.41 | 1.49 | 46 | 9 |
| Croatia | 0.95 | 0.118 | 0.059 | 0.316 | 0.067 | 0.008 | 0.471 | 0.023 | 14.26 | 3 | 4.47 | 2.20 | 19 | 2 |
| Czech Republic | 0.70 | -0.056 | 0.222 | 0.823 | 0.035 | -0.002 | 0.333 | 0.043 | 17.40 | 3 | 3.38 | 1.64 | 20 | 2 |
| Denmark | 4.02 | 0.183 | 0.359 | 0.999 | 0.410 | 0.014 | 0.618 | 0.099 | 10.51 | 3 | 5.41 | 5.36 | 341 | 35 |
| Egypt | 1.70 | 0.143 | 0.143 | 0.363 | 0.180 | 0.015 | 0.286 | 0.035 | 10.63 | 2 | 2.59 | 2.16 | 27 | 6 |
| Finland | 6.22 | 0.100 | 0.428 | 0.786 | 0.854 | 0.014 | 0.346 | 0.061 | 7.36 | 1 | 3.18 | 2.04 | 482 | 54 |
| France | 3.64 | 0.163 | 0.340 | 0.780 | 0.345 | 0.016 | 0.509 | 0.079 | 9.98 | 0 | 2.63 | 3.14 | 3,400 | 430 |
| Germany | 1.77 | 0.175 | 0.147 | 0.624 | 0.134 | 0.011 | 0.282 | 0.049 | 13.39 | 3 | 3.39 | 4.17 | 2,299 | 290 |
| Greece | 2.94 | 0.049 | 0.192 | 0.493 | 0.321 | 0.004 | 0.304 | 0.048 | 9.91 | 1 | 2.23 | 3.18 | 320 | 34 |
| Hong Kong | 3.75 | 0.060 | 0.194 | 0.272 | 0.394 | 0.009 | 0.418 | 0.031 | 9.88 | 4 | 4.18 | 6.35 | 1,697 | 373 |
| Hungary | 3.43 | 0.136 | 0.227 | 0.467 | 0.417 | 0.022 | 0.364 | 0.049 | 9.50 | 1 | 3.34 | 2.75 | 30 | 8 |
| India | 4.72 | 0.033 | 0.408 | 0.564 | 0.507 | 0.006 | 0.559 | 0.047 | 9.36 | 2 | 5.01 | 5.86 | 1,467 | 406 |
| Indonesia | 2.51 | -0.018 | 0.224 | 0.361 | 0.219 | -0.003 | 0.606 | 0.032 | 11.67 | 2 | 4.24 | 5.19 | 218 | 53 |
| Ireland | 5.02 | 0.067 | 0.417 | 1.006 | 0.527 | 0.010 | 0.552 | 0.082 | 9.12 | 1 | 3.72 | 6.48 | 564 | 68 |
| Israel | 3.93 | 0.080 | 0.275 | 0.674 | 0.534 | 0.014 | 0.445 | 0.079 | 7.55 | 3 | 3.39 | 5.83 | 825 | 99 |
| Italy | 4.78 | 0.136 | 0.334 | 0.921 | 0.448 | 0.011 | 0.475 | 0.077 | 10.77 | 2 | 2.38 | 2.62 | 934 | 113 |
| Japan | 1.97 | 0.335 | 0.309 | 0.627 | 0.200 | 0.032 | 0.551 | 0.063 | 10.81 | 2 | 3.43 | 3.44 | 1,795 | 386 |
| Kenya | 5.90 | 0.235 | 0.235 | 1.526 | 0.544 | 0.024 | 0.471 | 0.156 | 10.70 | 4 | 3.33 | 3.89 | 20 | 3 |
| Malaysia | 3.78 | 0.050 | 0.282 | 0.417 | 0.494 | 0.005 | 0.419 | 0.044 | 7.82 | 3 | 4.16 | 5.45 | 700 | 144 |
| Mexico | 5.67 | -0.004 | 0.318 | 0.585 | 0.494 | 0.005 | 0.500 | 0.044 | 11.59 | 0 | 3.78 | 4.60 | 284 | 48 |
| Morocco | 0.25 | 0.000 | 0.000 | 0.000 | 0.026 | 0.000 | 0.143 | 0.003 | 12.62 | 1 | 4.04 | 2.29 | 16 | 2 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Netherlands | 4.48 | 0.146 | 0.373 | 0.783 | 0.532 | 0.016 | 0.527 | 0.092 | 8.36 | 3 | 2.88 | 3.73 | 921 | 115 |
| New Zealand | 5.00 | 0.109 | 0.429 | 0.524 | 0.726 | 0.020 | 0.440 | 0.054 | 6.91 | 4 | 5.01 | 8.34 | 223 | 48 |
| Nigeria | 2.48 | 0.328 | 0.358 | 0.787 | 0.237 | 0.031 | 0.642 | 0.080 | 10.11 | 4 | 3.53 | 2.41 | 85 | 18 |
| Norway | 3.07 | 0.203 | 0.325 | 1.013 | 0.427 | 0.026 | 0.400 | 0.135 | 7.35 | 2 | 3.36 | 5.10 | 802 | 97 |
| Pakistan | 1.00 | 0.000 | 0.000 | 0.000 | 0.101 | 0.000 | 0.000 | 0.000 | 10.50 | 1 | 1.07 | 0.43 | 4 | 2 |
| Panama | 2.92 | 0.182 | 0.273 | 0.515 | 0.270 | 0.015 | 0.364 | 0.042 | 10.75 | 4 | 2.65 | 0.58 | 12 | 1 |
| Peru | 3.58 | -0.053 | 0.474 | 0.548 | 0.445 | -0.003 | 0.526 | 0.061 | 8.25 | 0 | 2.36 | 2.41 | 24 | 5 |
| Philippines | 2.82 | 0.000 | 0.158 | 0.284 | 0.274 | 0.001 | 0.250 | 0.027 | 10.41 | 1 | 2.94 | 3.49 | 147 | 27 |
| Poland | 2.62 | 0.179 | 0.348 | 0.916 | 0.202 | 0.010 | 0.589 | 0.074 | 12.88 | 1 | 3.05 | 1.81 | 137 | 25 |
| Portugal | 2.80 | 0.110 | 0.278 | 0.892 | 0.235 | 0.007 | 0.498 | 0.073 | 10.65 | 1 | 1.46 | 1.15 | 296 | 33 |
| Russia | 3.54 | -0.014 | 0.466 | 0.944 | 0.346 | -0.001 | 0.591 | 0.095 | 10.38 | 2 | 3.48 | 4.05 | 328 | 49 |
| Singapore | 3.92 | 0.003 | 0.252 | 0.394 | 0.519 | 0.002 | 0.416 | 0.047 | 7.54 | 3 | 2.89 | 4.34 | 1,064 | 200 |
| South Africa | 5.40 | 0.174 | 0.460 | 0.826 | 0.528 | 0.017 | 0.622 | 0.071 | 10.15 | 3 | 4.18 | 3.84 | 1,062 | 166 |
| South Korea | 2.48 | -0.049 | 0.262 | 0.500 | 0.300 | -0.007 | 0.390 | 0.057 | 8.05 | 3 | 3.41 | 2.94 | 210 | 46 |
| Spain | 4.22 | 0.082 | 0.380 | 0.792 | 0.369 | 0.009 | 0.581 | 0.073 | 11.72 | 2 | 2.35 | 3.36 | 881 | 110 |
| Sweden | 4.60 | 0.238 | 0.413 | 1.115 | 0.537 | 0.028 | 0.543 | 0.130 | 8.91 | 1 | 4.74 | 6.40 | 1,391 | 149 |
| Switzerland | 3.16 | 0.149 | 0.261 | 0.600 | 0.388 | 0.018 | 0.331 | 0.071 | 7.61 | 1 | 4.53 | 4.49 | 1,027 | 142 |
| Thailand | 5.93 | 0.009 | 0.346 | 0.464 | 0.443 | -0.000 | 0.477 | 0.032 | 13.25 | 2 | 4.26 | 5.92 | 140 | 33 |
| Turkey | 2.60 | 0.135 | 0.177 | 0.300 | 0.279 | 0.012 | 0.271 | 0.032 | 9.61 | 2 | 2.82 | 2.51 | 121 | 25 |
| United Kingdom | 2.65 | 0.052 | 0.301 | 0.544 | 0.375 | 0.009 | 0.467 | 0.077 | 6.59 | 4 | 3.61 | 6.90 | 12,595 | 1,680 |
| United States | 6.18 | 0.140 | 0.425 | 0.821 | 0.746 | 0.014 | 0.516 | 0.068 | 8.20 | 1 | 4.13 | 7.03 | 38,874 | 4,678 |
| Mean/Total | 4.77 | 0.119 | 0.370 | 0.700 | 0.576 | 0.013 | 0.494 | 0.068 | 8.35 | 1.84 | 3.91 | 6.64 | 86,913 | 11,965 |

**Table 2**

Board independence and bankruptcy penalties

This table presents estimates of OLS regressions. The dependent variable is the logarithm of the number of independent directors (plus one) in Panel A, the ratio of the number of independent directors to board size in Panel B, and the logarithm of board size in Panel C. Columns 1 to 6 present the results for the full sample. Column 7 presents the results when US firms are excluded, and column 8 shows the results when US and UK firms are excluded. *t*-values are reported in parentheses and are based on standard errors clustered at the country level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Refer to Table A.1 in the Appendix for variable definitions.

Panel A. Dependent variable: logarithm of the number of independent directors

| | All countries | | | | | | Exclude US | Exclude US & UK |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| CRIGHTS | -0.201*** | -0.085*** | | | | | -0.072*** | -0.052** |
| | (-3.75) | (-4.21) | | | | | (-3.64) | (-2.06) |
| AUTOSTAY | | | -0.142** | | | | | |
| | | | (-2.27) | | | | | |
| REORG | | | | -0.191*** | | | | |
| | | | | (-3.47) | | | | |
| SECURED | | | | | -0.071 | | | |
| | | | | | (-0.66) | | | |
| MANAGES | | | | | | -0.173*** | | |
| | | | | | | (-3.19) | | |
| Size | | 0.116*** | 0.117*** | 0.118*** | 0.120*** | 0.118*** | 0.139*** | 0.116*** |
| | | (6.74) | (6.67) | (6.54) | (6.28) | (6.51) | (8.92) | (8.32) |
| Leverage | | -0.101*** | -0.097*** | -0.099*** | -0.095*** | -0.104*** | -0.134*** | -0.102** |
| | | (-2.90) | (-2.82) | (-2.83) | (-2.77) | (-2.88) | (-3.24) | (-2.20) |
| Return on assets | | -0.104 | -0.104 | -0.094 | -0.087 | -0.089 | -0.002 | -0.128 |
| | | (-1.27) | (-1.26) | (-1.06) | (-0.93) | (-0.98) | (-0.02) | (-1.14) |
| Return volatility | | -0.064*** | -0.079*** | -0.066*** | -0.085*** | -0.068*** | -0.074** | -0.076 |
| | | (-3.00) | (-3.30) | (-2.98) | (-3.56) | (-3.08) | (-2.53) | (-1.58) |
| Market-to-book | | 0.011* | 0.011* | 0.012** | 0.013* | 0.012* | 0.021*** | 0.013** |
| | | (1.98) | (1.97) | (2.02) | (2.00) | (2.00) | (3.60) | (2.39) |
| Free cash flow | | 0.038 | 0.034 | 0.027 | 0.017 | 0.023 | -0.012 | 0.091 |
| | | (0.63) | (0.56) | (0.39) | (0.24) | (0.34) | (-0.15) | (1.03) |
| Insider ownership | | -0.370*** | -0.374*** | -0.369*** | -0.391*** | -0.379*** | -0.450*** | -0.493*** |
| | | (-6.90) | (-7.25) | (-6.92) | (-6.84) | (-6.83) | (-7.20) | (-7.14) |
| SHRIGHTS | | -0.162*** | -0.190*** | -0.174*** | -0.226*** | -0.167*** | -0.177*** | -0.164*** |
| | | (-4.22) | (-4.90) | (-4.57) | (-5.18) | (-4.91) | (-4.23) | (-3.86) |
| Rule of law | | -0.020 | -0.044 | 0.002 | -0.004 | -0.059 | -0.020 | -0.016 |
| | | (-0.23) | (-0.48) | (0.02) | (-0.04) | (-0.68) | (-0.23) | (-0.19) |
| English legal origin | | 0.612*** | 0.547*** | 0.618*** | 0.613*** | 0.524*** | 0.653*** | 0.570*** |
| | | (4.36) | (3.94) | (4.95) | (3.88) | (3.53) | (4.52) | (4.22) |
| French legal origin | | 0.040 | 0.039 | 0.117 | 0.082 | 0.037 | 0.062 | 0.033 |
| | | (0.29) | (0.28) | (0.81) | (0.56) | (0.25) | (0.45) | (0.24) |
| German legal origin | | -0.407*** | -0.511*** | -0.410*** | -0.445*** | -0.467*** | -0.441*** | -0.507*** |
| | | (-3.13) | (-4.39) | (-3.37) | (-3.19) | (-3.60) | (-3.34) | (-4.23) |
| Nordic legal origin | | 0.255 | 0.314 | 0.245 | 0.360 | 0.181 | 0.288 | 0.260 |
| | | (1.23) | (1.53) | (1.15) | (1.64) | (0.77) | (1.37) | (1.22) |
| GDP per capita | | -0.047 | -0.071 | -0.038 | -0.066 | -0.000 | -0.037 | -0.043 |
| | | (-0.89) | (-1.37) | (-0.71) | (-1.14) | (-0.01) | (-0.70) | (-0.80) |
| Market cap | | -0.018 | 0.004 | -0.017 | 0.005 | -0.012 | -0.008 | 0.011 |
| | | (-0.90) | (0.16) | (-0.75) | (0.20) | (-0.55) | (-0.24) | (0.30) |
| Year fixed effects | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 86,913 | 86,913 | 86,913 | 86,913 | 86,913 | 86,913 | 48,039 | 35,444 |
| Number of countries | 50 | 50 | 50 | 50 | 50 | 50 | 49 | 48 |
| $R^2$ | 0.171 | 0.534 | 0.528 | 0.532 | 0.523 | 0.530 | 0.418 | 0.377 |

*(continued)*

**Table 2** *(continued)*

Panel B. Dependent variable: ratio of the number of independent directors to board size

| | All countries | | | | | | Exclude US | Exclude US & UK |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| CRIGHTS | -0.093*** | -0.045*** | | | | | -0.039*** | -0.030** |
| | (-2.92) | (-4.86) | | | | | (-4.01) | (-2.27) |
| AUTOSTAY | | | -0.097*** | | | | | |
| | | | (-4.83) | | | | | |
| REORG | | | | -0.074*** | | | | |
| | | | | (-2.76) | | | | |
| SECURED | | | | | -0.020 | | | |
| | | | | | (-0.46) | | | |
| MANAGES | | | | | | -0.095*** | | |
| | | | | | | (-3.95) | | |
| Size | | 0.020*** | 0.020*** | 0.021*** | 0.021*** | 0.021*** | 0.026*** | 0.015*** |
| | | (3.17) | (3.21) | (3.04) | (2.96) | (3.07) | (3.50) | (2.93) |
| Leverage | | -0.040*** | -0.038*** | -0.039*** | -0.038*** | -0.042*** | -0.034** | -0.022 |
| | | (-4.66) | (-4.42) | (-4.08) | (-3.80) | (-4.60) | (-2.07) | (-1.18) |
| Return on assets | | 0.003 | 0.000 | 0.010 | 0.013 | 0.011 | 0.067** | 0.031 |
| | | (0.08) | (0.01) | (0.23) | (0.28) | (0.25) | (2.34) | (0.85) |
| Return volatility | | -0.022*** | -0.029*** | -0.026*** | -0.033*** | -0.024*** | -0.020* | -0.011 |
| | | (-2.91) | (-3.58) | (-3.20) | (-4.26) | (-3.01) | (-1.81) | (-0.42) |
| Market-to-book | | 0.001 | 0.001 | 0.002 | 0.002 | 0.002 | 0.004 | 0.001 |
| | | (0.62) | (0.41) | (0.85) | (0.89) | (0.80) | (1.65) | (0.23) |
| Free cash flow | | -0.015 | -0.014 | -0.023 | -0.027 | -0.023 | -0.052* | -0.015 |
| | | (-0.51) | (-0.52) | (-0.68) | (-0.77) | (-0.68) | (-1.88) | (-0.52) |
| Insider ownership | | -0.230*** | -0.230*** | -0.232*** | -0.241*** | -0.235*** | -0.246*** | -0.266*** |
| | | (-14.68) | (-16.87) | (-13.15) | (-12.23) | (-13.72) | (-10.04) | (-10.30) |
| SHRIGHTS | | -0.090*** | -0.101*** | -0.103*** | -0.123*** | -0.092*** | -0.092*** | -0.086*** |
| | | (-5.41) | (-7.17) | (-6.38) | (-6.05) | (-5.65) | (-5.20) | (-5.10) |
| Rule of law | | 0.021 | 0.005 | 0.029 | 0.025 | -0.001 | 0.023 | 0.025 |
| | | (0.54) | (0.14) | (0.65) | (0.56) | (-0.01) | (0.64) | (0.68) |
| English legal origin | | 0.224*** | 0.186*** | 0.220*** | 0.213*** | 0.177*** | 0.233*** | 0.196*** |
| | | (3.61) | (3.38) | (3.47) | (2.93) | (2.97) | (3.83) | (3.47) |
| French legal origin | | -0.098* | -0.106* | -0.062 | -0.075 | -0.100* | -0.088 | -0.100* |
| | | (-1.73) | (-1.94) | (-0.82) | (-1.04) | (-1.74) | (-1.54) | (-1.85) |
| German legal origin | | -0.220*** | -0.278*** | -0.232*** | -0.250*** | -0.251*** | -0.225*** | -0.251*** |
| | | (-3.59) | (-5.76) | (-3.68) | (-3.59) | (-4.48) | (-3.63) | (-4.35) |
| Nordic legal origin | | 0.058 | 0.088 | 0.064 | 0.105 | 0.017 | 0.067 | 0.056 |
| | | (0.70) | (1.10) | (0.65) | (1.09) | (0.19) | (0.84) | (0.70) |
| GDP per capita | | -0.010 | -0.025 | -0.007 | -0.017 | 0.016 | -0.007 | -0.010 |
| | | (-0.40) | (-1.07) | (-0.25) | (-0.54) | (0.61) | (-0.30) | (-0.43) |
| Market cap | | -0.010 | 0.001 | -0.006 | 0.003 | -0.007 | -0.009 | -0.000 |
| | | (-1.21) | (0.16) | (-0.56) | (0.32) | (-0.80) | (-0.78) | (-0.02) |
| Year fixed effects | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 86,913 | 86,913 | 86,913 | 86,913 | 86,913 | 86,913 | 48,039 | 35,444 |
| Number of countries | 50 | 50 | 50 | 50 | 50 | 50 | 49 | 48 |
| $R^2$ | 0.188 | 0.575 | 0.573 | 0.566 | 0.559 | 0.571 | 0.398 | 0.422 |

*(continued)*

**Table 2** *(continued)*

Panel C. Dependent variable: logarithm of board size

| | All countries | | | | | | Exclude US | Exclude US & UK |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| CRIGHTS | -0.055* | -0.027 | | | | | -0.012 | 0.002 |
| | (-1.80) | (-1.54) | | | | | (-0.57) | (0.07) |
| AUTOSTAY | | | -0.048 | | | | | |
| | | | (-1.05) | | | | | |
| REORG | | | | -0.080 | | | | |
| | | | | (-1.33) | | | | |
| SECURED | | | | | -0.082 | | | |
| | | | | | (-1.42) | | | |
| MANAGES | | | | | | -0.019 | | |
| | | | | | | (-0.33) | | |
| Size | | 0.107*** | 0.107*** | 0.107*** | 0.108*** | 0.108*** | 0.118*** | 0.115*** |
| | | (13.27) | (13.45) | (13.12) | (12.92) | (12.85) | (18.57) | (14.49) |
| Leverage | | -0.039 | -0.037 | -0.038 | -0.036 | -0.038 | -0.088*** | -0.081** |
| | | (-1.37) | (-1.34) | (-1.37) | (-1.33) | (-1.37) | (-3.60) | (-2.43) |
| Return on assets | | -0.147*** | -0.147*** | -0.145*** | -0.143*** | -0.141*** | -0.137** | -0.167*** |
| | | (-5.20) | (-5.55) | (-5.06) | (-4.76) | (-4.73) | (-2.61) | (-2.74) |
| Return volatility | | -0.023 | -0.028 | -0.022 | -0.029 | -0.028 | -0.041* | -0.073** |
| | | (-1.43) | (-1.46) | (-1.51) | (-1.61) | (-1.63) | (-1.90) | (-2.58) |
| Market-to-book | | 0.013*** | 0.013*** | 0.014*** | 0.014*** | 0.014*** | 0.018*** | 0.012*** |
| | | (3.20) | (3.30) | (3.15) | (3.08) | (3.09) | (3.61) | (2.82) |
| Free cash flow | | 0.078*** | 0.077*** | 0.076*** | 0.073*** | 0.072*** | 0.074 | 0.092 |
| | | (3.12) | (3.48) | (2.99) | (2.94) | (2.83) | (1.55) | (1.53) |
| Insider ownership | | 0.034 | 0.033 | 0.036 | 0.025 | 0.029 | 0.050 | 0.008 |
| | | (1.23) | (1.14) | (1.35) | (0.91) | (1.05) | (1.33) | (0.26) |
| SHRIGHTS | | 0.008 | -0.000 | 0.009 | -0.017 | -0.005 | 0.033 | 0.037 |
| | | (0.29) | (-0.02) | (0.30) | (-0.65) | (-0.16) | (1.08) | (1.20) |
| Rule of law | | 0.022 | 0.014 | 0.031 | 0.043 | 0.017 | 0.037 | 0.035 |
| | | (0.28) | (0.17) | (0.44) | (0.54) | (0.21) | (0.45) | (0.43) |
| English legal origin | | 0.025 | 0.004 | 0.033 | 0.064 | 0.006 | 0.021 | 0.010 |
| | | (0.20) | (0.03) | (0.27) | (0.50) | (0.05) | (0.16) | (0.08) |
| French legal origin | | 0.068 | 0.066 | 0.095 | 0.076 | 0.077 | 0.108 | 0.103 |
| | | (0.56) | (0.53) | (0.83) | (0.65) | (0.65) | (0.88) | (0.87) |
| German legal origin | | 0.113 | 0.079 | 0.120 | 0.136 | 0.089 | 0.163 | 0.134 |
| | | (0.92) | (0.62) | (1.02) | (1.06) | (0.69) | (1.30) | (1.03) |
| Nordic legal origin | | 0.013 | 0.032 | 0.002 | 0.076 | 0.020 | -0.001 | -0.001 |
| | | (0.08) | (0.19) | (0.01) | (0.46) | (0.12) | (-0.01) | (-0.00) |
| GDP per capita | | -0.056 | -0.064 | -0.052 | -0.073* | -0.052 | -0.069 | -0.070 |
| | | (-1.19) | (-1.40) | (-1.08) | (-1.69) | (-1.00) | (-1.32) | (-1.32) |
| Market cap | | -0.001 | 0.006 | -0.003 | 0.004 | 0.005 | -0.031* | -0.019 |
| | | (-0.06) | (0.34) | (-0.22) | (0.26) | (0.32) | (-1.88) | (-0.96) |
| Year fixed effects | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 86,913 | 86,913 | 86,913 | 86,913 | 86,913 | 86,913 | 48,039 | 35,444 |
| Number of countries | 50 | 50 | 50 | 50 | 50 | 50 | 49 | 48 |
| $R^2$ | 0.036 | 0.467 | 0.465 | 0.468 | 0.465 | 0.464 | 0.497 | 0.432 |

**Table 3**

Board independence and bankruptcy penalties: difference in default probability

This table presents estimates of OLS regressions. The dependent variable is the logarithm of the number of independent directors (plus one) in Panel A, the ratio of the number of independent directors to board size in Panel B, and the logarithm of board size in Panel C. Columns 1 to 7 show the results for the full sample. Columns 8 and 9 show the results when US and UK firms are excluded. For columns 1 and 8, HighRisk is a dummy variable that equals one if a firm has a default probability that is above the median bankruptcy probability distribution of its country for a given year (low Altman's Z-score), and zero if a firm has a default probability that is below the median bankruptcy probability distribution (high Altman's Z-score). For column 2, HighRisk is a dummy variable that equals one if a firm has a default probability that is in the highest tercile of the bankruptcy probability distribution, and zero if a firm has a default probability that is in the lowest tercile of the bankruptcy probability distribution (cutting off the middle 33% of the distribution). For columns 3–7 and 9, HighRisk is a dummy variable that equals one if a firm has a default probability that is in the highest quartile of the bankruptcy probability distribution, and zero if a firm has a default probability that is in the lowest quartile of the bankruptcy probability distribution (cutting off the middle 50% of the distribution). *t*-values are reported in parentheses and are based on standard errors clustered at the country level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Refer to Table A.1 in the Appendix for variable definitions.

Panel A. Dependent variable: logarithm of the number of independent directors

| | All countries | | | | | | | Exclude US & UK | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| CRIGHTS x HighRisk | -0.024*** | -0.036*** | -0.045*** | | | | | -0.032*** | -0.052*** |
| | (-5.57) | (-6.55) | (-8.23) | | | | | (-3.92) | (-4.12) |
| CRIGHTS | -0.073*** | -0.072*** | -0.070*** | | | | | -0.036 | -0.029 |
| | (-3.41) | (-3.17) | (-3.08) | | | | | (-1.30) | (-0.91) |
| AUTOSTAY x HighRisk | | | | -0.099*** | | | | | |
| | | | | (-5.63) | | | | | |
| AUTOSTAY | | | | -0.108 | | | | | |
| | | | | (-1.68) | | | | | |
| REORG x HighRisk | | | | | -0.096*** | | | | |
| | | | | | (-4.68) | | | | |
| REORG | | | | | -0.163*** | | | | |
| | | | | | (-2.85) | | | | |
| SECURED x HighRisk | | | | | | -0.086** | | | |
| | | | | | | (-2.15) | | | |
| SECURED | | | | | | -0.053 | | | |
| | | | | | | (-0.45) | | | |
| MANAGES x HighRisk | | | | | | | -0.094*** | | |
| | | | | | | | (-4.54) | | |
| MANAGES | | | | | | | -0.137** | | |
| | | | | | | | (-2.30) | | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 86,867 | 57,840 | 43,356 | 43,356 | 43,356 | 43,356 | 43,356 | 35,398 | 17,623 |
| Number of countries | 49 | 45 | 44 | 44 | 44 | 44 | 44 | 47 | 42 |
| $R^2$ | 0.536 | 0.531 | 0.525 | 0.518 | 0.521 | 0.510 | 0.519 | 0.380 | 0.358 |

*(continued)*

**Table 3** *(continued)*

Panel B. Dependent variable: ratio of the number of independent directors to board size

| | All countries | | | | | | | Exclude US & UK | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| CRIGHTS x HighRisk | -0.006*** | -0.010*** | -0.012*** | | | | | -0.008** | -0.014*** |
| | (-3.78) | (-5.46) | (-7.43) | | | | | (-2.18) | (-3.61) |
| CRIGHTS | -0.042*** | -0.042*** | -0.042*** | | | | | -0.026* | -0.023 |
| | (-4.48) | (-4.19) | (-4.15) | | | | | (-1.97) | (-1.62) |
| AUTOSTAY x HighRisk | | | | -0.018** | | | | | |
| | | | | (-2.28) | | | | | |
| AUTOSTAY | | | | -0.094*** | | | | | |
| | | | | (-4.46) | | | | | |
| REORG x HighRisk | | | | | -0.028*** | | | | |
| | | | | | (-4.97) | | | | |
| REORG | | | | | -0.071** | | | | |
| | | | | | (-2.65) | | | | |
| SECURED x HighRisk | | | | | | -0.019* | | | |
| | | | | | | (-1.76) | | | |
| SECURED | | | | | | -0.009 | | | |
| | | | | | | (-0.18) | | | |
| MANAGES x HighRisk | | | | | | | -0.030*** | | |
| | | | | | | | (-5.22) | | |
| MANAGES | | | | | | | -0.086*** | | |
| | | | | | | | (-3.44) | | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 86,867 | 57,840 | 43,356 | 43,356 | 43,356 | 43,356 | 43,356 | 35,398 | 17,623 |
| Number of countries | 49 | 45 | 44 | 44 | 44 | 44 | 44 | 47 | 42 |
| $R^2$ | 0.576 | 0.565 | 0.556 | 0.552 | 0.546 | 0.537 | 0.551 | 0.423 | 0.387 |

Panel C. Dependent variable: logarithm of board size

| | All countries | | | | | | | Exclude US & UK | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| CRIGHTS x HighRisk | -0.014*** | -0.021*** | -0.027*** | | | | | -0.009 | -0.016 |
| | (-3.52) | (-4.17) | (-4.84) | | | | | (-0.91) | (-1.27) |
| CRIGHTS | -0.020 | -0.015 | -0.011 | | | | | 0.006 | 0.009 |
| | (-1.16) | (-0.92) | (-0.71) | | | | | (0.21) | (0.31) |
| AUTOSTAY x HighRisk | | | | -0.096*** | | | | | |
| | | | | (-9.55) | | | | | |
| AUTOSTAY | | | | 0.002 | | | | | |
| | | | | (0.06) | | | | | |
| REORG x HighRisk | | | | | -0.052** | | | | |
| | | | | | (-2.08) | | | | |
| REORG | | | | | -0.049 | | | | |
| | | | | | (-0.89) | | | | |
| SECURED x HighRisk | | | | | | -0.035 | | | |
| | | | | | | (-0.90) | | | |
| SECURED | | | | | | -0.061 | | | |
| | | | | | | (-1.04) | | | |
| MANAGES x HighRisk | | | | | | | -0.040 | | |
| | | | | | | | (-1.51) | | |
| MANAGES | | | | | | | 0.005 | | |
| | | | | | | | (0.09) | | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 86,867 | 57,840 | 43,356 | 43,356 | 43,356 | 43,356 | 43,356 | 35,398 | 17,623 |
| Number of countries | 49 | 45 | 44 | 44 | 44 | 44 | 44 | 47 | 42 |
| $R^2$ | 0.467 | 0.469 | 0.472 | 0.472 | 0.472 | 0.468 | 0.468 | 0.432 | 0.456 |

**Table 4**

Bankruptcy reform in Germany and changes in corporate boards

This table presents estimates of difference-in-differences regressions for the bankruptcy reform in Germany. The dependent variable is the logarithm of the number of independent directors (plus one) in columns 1 and 2, the ratio of the number of independent directors to board size in columns 3 and 4, and the logarithm of board size in columns 5 and 6. HighRisk is a dummy variable that equals one if the firm has a high probability of default (highest quartile of the bankruptcy probability distribution), and zero if it has a low probability of default (lowest quartile). Post is a dummy variable that equals one for the years after the bankruptcy reform was passed (2012 to 2016), and zero for the years before the reform was passed (2007 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 A.1 in the Appendix for variable definitions.

| | log(Number of independent directors) | | Ratio of independents to board size | | log(Board size) | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Post x HighRisk | 0.270** | 0.286*** | 0.075** | 0.075** | -0.025 | 0.010 |
| | (2.54) | (2.78) | (2.49) | (2.56) | (-0.62) | (0.23) |
| Post | 0.402*** | 0.381*** | 0.101*** | 0.098*** | -0.032 | -0.060 |
| | (4.21) | (3.88) | (3.63) | (3.41) | (-0.69) | (-1.19) |
| Size | | 0.085 | | 0.003 | | 0.139*** |
| | | (1.20) | | (0.11) | | (2.73) |
| Leverage | | -0.128 | | 0.017 | | 0.143 |
| | | (-0.73) | | (0.29) | | (1.19) |
| Return on assets | | -0.303 | | -0.040 | | -0.109 |
| | | (-0.42) | | (-0.20) | | (-0.61) |
| Market-to-book | | -0.006 | | -0.009 | | 0.011 |
| | | (-0.26) | | (-1.26) | | (1.22) |
| Free cash flow | | 0.294 | | 0.043 | | 0.078 |
| | | (0.41) | | (0.22) | | (0.43) |
| Insider ownership | | -0.257** | | -0.051* | | -0.042 |
| | | (-2.09) | | (-1.73) | | (-0.77) |
| Firm fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 778 | 778 | 778 | 778 | 778 | 778 |
| Number of firms | 110 | 110 | 110 | 110 | 110 | 110 |
| $R^2$ (within) | 0.212 | 0.230 | 0.181 | 0.190 | 0.017 | 0.080 |

**Table 5**

Bankruptcy reforms in Italy and changes in corporate boards

This table presents estimates of difference-in-differences regressions for the bankruptcy reforms of 2005 (Panel A) and 2006 (Panel B) in Italy. The dependent variable is the logarithm of the number of independent directors (plus one) in columns 1 and 2, the ratio of the number of independent directors to board size in columns 3 and 4, and the logarithm of board size in columns 5 and 6. HighRisk is a dummy variable that equals one if the firm has a high probability of default (highest quartile of the bankruptcy probability distribution), and zero if it has a low probability of default (lowest quartile). For the 2005 reform (Panel A), Post is a dummy variable that equals one for the year after the bankruptcy reform was passed (2006), and zero for the years before the reform was passed (2002 to 2005). For the 2006 reform (Panel B), Post is a dummy variable that equals one for the years after the reform was passed (2007 to 2011), and zero for the year before the reform was passed (2006). *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 A.1 in the Appendix for variable definitions.

Panel A. 2005 reform

| | log(Number of independent directors) | | Ratio of independents to board size | | log(Board size) | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Post x HighRisk | 0.266** | 0.251** | 0.065 | 0.068 | 0.102 | 0.083 |
| | (2.06) | (2.10) | (1.39) | (1.37) | (1.07) | (0.99) |
| Post | -0.167 | -0.273** | -0.055 | -0.057 | -0.045 | -0.134 |
| | (-1.32) | (-2.13) | (-1.62) | (-1.26) | (-0.64) | (-1.60) |
| Size | | 0.107 | | -0.017 | | 0.148** |
| | | (1.45) | | (-0.39) | | (2.23) |
| Leverage | | -0.108 | | 0.153 | | -0.271 |
| | | (-0.22) | | (0.54) | | (-0.73) |
| Return on assets | | 0.496 | | 0.296 | | 0.018 |
| | | (0.85) | | (1.20) | | (0.05) |
| Market-to-book | | 0.219** | | 0.052 | | 0.052 |
| | | (2.54) | | (1.52) | | (0.64) |
| Free cash flow | | 0.162 | | -0.070 | | 0.206 |
| | | (0.64) | | (-0.51) | | (0.81) |
| Insider ownership | | 0.270 | | 0.124 | | -0.099 |
| | | (1.45) | | (1.39) | | (-0.47) |
| Firm fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 107 | 107 | 107 | 107 | 107 | 107 |
| Number of firms | 27 | 27 | 27 | 27 | 27 | 27 |
| $R^2$ (within) | 0.092 | 0.260 | 0.066 | 0.133 | 0.036 | 0.203 |

Panel B. 2006 reform

| | log(Number of independent directors) | | Ratio of independents to board size | | log(Board size) | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Post x HighRisk | -0.268** | -0.275** | -0.090** | -0.098*** | 0.038 | 0.015 |
| | (-2.12) | (-2.51) | (-2.47) | (-3.11) | (0.38) | (0.18) |
| Post | 0.149 | 0.137 | 0.045 | 0.063* | 0.029 | 0.049 |
| | (1.50) | (1.22) | (1.49) | (1.85) | (0.69) | (0.79) |
| Size | | 0.215* | | -0.060 | | 0.261*** |
| | | (1.76) | | (-1.33) | | (2.80) |
| Leverage | | 0.343 | | 0.219** | | -0.368 |
| | | (1.05) | | (2.29) | | (-1.33) |
| Return on assets | | -0.628 | | 0.310 | | 0.879 |
| | | (-0.32) | | (0.45) | | (0.94) |
| Market-to-book | | 0.020 | | 0.006 | | 0.018 |
| | | (0.80) | | (0.65) | | (1.33) |
| Free cash flow | | 0.546 | | -0.254 | | -1.121 |
| | | (0.28) | | (-0.38) | | (-1.22) |
| Insider ownership | | -0.119 | | -0.085* | | 0.136 |
| | | (-1.38) | | (-1.82) | | (1.11) |
| Firm fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 135 | 135 | 135 | 135 | 135 | 135 |
| Number of firms | 25 | 25 | 25 | 25 | 25 | 25 |
| $R^2$ (within) | 0.086 | 0.140 | 0.074 | 0.151 | 0.018 | 0.197 |

**Table 6**

Bankruptcy reforms in Germany and Italy and changes in corporate boards of firms in other countries

This table presents estimates of difference-in-differences regressions for firms in other countries for the bankruptcy reform of 2012 in Germany (Panel A) and the bankruptcy reforms of 2005 (Panel B) and 2006 (Panel C) in Italy. The dependent variable is the logarithm of the number of independent directors (plus one) in columns 1 and 4, the ratio of the number of independent directors to board size in columns 2 and 5, and the logarithm of board size in columns 3 and 6. Columns 1 to 3 present the results for firms in Austria, Belgium, France, Netherlands, and Switzerland, and columns 4 to 6 present the results for US firms. HighRisk is a dummy variable that equals one if the firm has a high probability of default (highest quartile of the bankruptcy probability distribution), and zero if it has a low probability of default (lowest quartile). For the 2012 reform in Germany (Panel A), Post is a dummy variable that equals one for the years after the bankruptcy reform was passed (2012 to 2016), and zero for the years before the reform was passed (2007 to 2011). For the 2005 reform in Italy (Panel B), Post is a dummy variable that equals one for the year after the bankruptcy reform was passed (2006), and zero for the years before the reform was passed (2002 to 2005). For the 2006 reform in Italy (Panel C), Post is a dummy variable that equals one for the years after the reform was passed (2007 to 2011), and zero for the year before the reform was passed (2006). *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 A.1 in the Appendix for variable definitions.

Panel A. 2012 reform in Germany

| | Similar countries | | | United States | | |
|---|---|---|---|---|---|---|
| | Independents | Ratio | Board size | Independents | Ratio | Board size |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Post x HighRisk | 0.014 | 0.016 | -0.018 | -0.004 | -0.001 | -0.004 |
| | (0.32) | (0.85) | (-0.66) | (-0.47) | (-0.16) | (-0.52) |
| Post | 0.204*** | 0.084*** | 0.024 | 0.050*** | 0.047*** | -0.008 |
| | (4.45) | (4.36) | (0.97) | (5.52) | (8.93) | (-0.96) |
| Firm controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,029 | 2,029 | 2,029 | 11,268 | 11,268 | 11,268 |
| Number of firms | 248 | 248 | 248 | 1,558 | 1,558 | 1,558 |
| $R^2$ (within) | 0.133 | 0.138 | 0.069 | 0.076 | 0.066 | 0.049 |

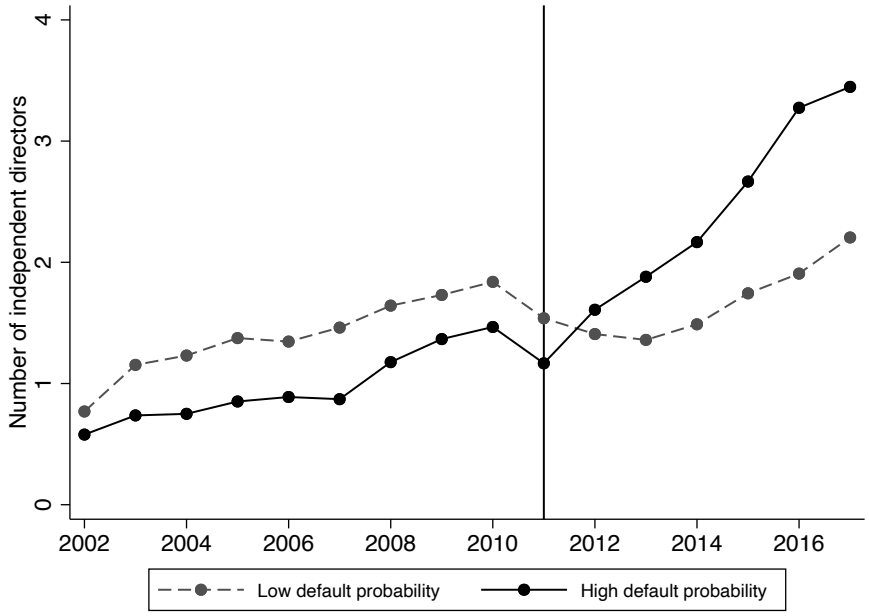
Panel B. 2005 reform in Italy

| | Similar countries | | | United States | | |
|---|---|---|---|---|---|---|
| | Independents | Ratio | Board size | Independents | Ratio | Board size |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Post x HighRisk | 0.017 | 0.019 | 0.007 | -0.015 | 0.004 | -0.024*** |
| | (0.38) | (1.20) | (0.23) | (-1.57) | (0.86) | (-2.95) |
| Post | 0.136** | 0.057** | -0.068** | 0.191*** | 0.124*** | 0.023*** |
| | (2.23) | (2.49) | (-2.04) | (15.87) | (18.77) | (2.60) |
| Firm controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 743 | 743 | 743 | 6,402 | 6,402 | 6,402 |
| Number of firms | 197 | 197 | 197 | 1,680 | 1,680 | 1,680 |
| $R^2$ (within) | 0.159 | 0.179 | 0.023 | 0.183 | 0.229 | 0.044 |

Panel C. 2006 reform in Italy

| | Similar countries | | | United States | | |
|---|---|---|---|---|---|---|
| | Independents | Ratio | Board size | Independents | Ratio | Board size |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Post x HighRisk | -0.032 | -0.019 | 0.017 | 0.004 | -0.001 | 0.006 |
| | (-0.80) | (-1.31) | (0.75) | (0.41) | (-0.30) | (0.70) |
| Post | 0.160*** | 0.069*** | -0.002 | 0.036*** | 0.036*** | -0.007 |
| | (4.58) | (5.20) | (-0.11) | (4.40) | (8.60) | (-0.86) |
| Firm controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 985 | 985 | 985 | 6,896 | 6,896 | 6,896 |
| Number of firms | 190 | 190 | 190 | 1,481 | 1,481 | 1,481 |
| $R^2$ (within) | 0.093 | 0.078 | 0.068 | 0.061 | 0.061 | 0.039 |

Panel A. Number of independent directors




Panel B. did estimate relative to 2011

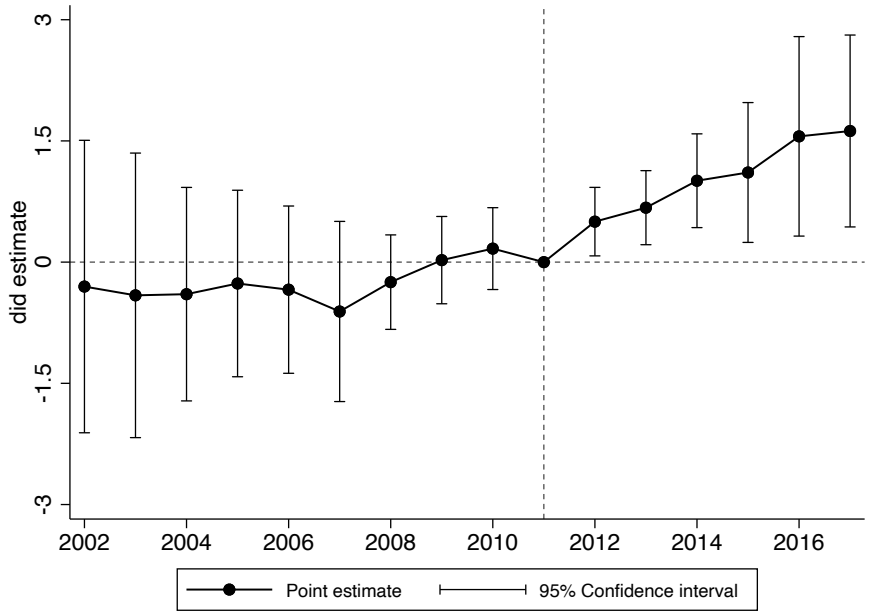
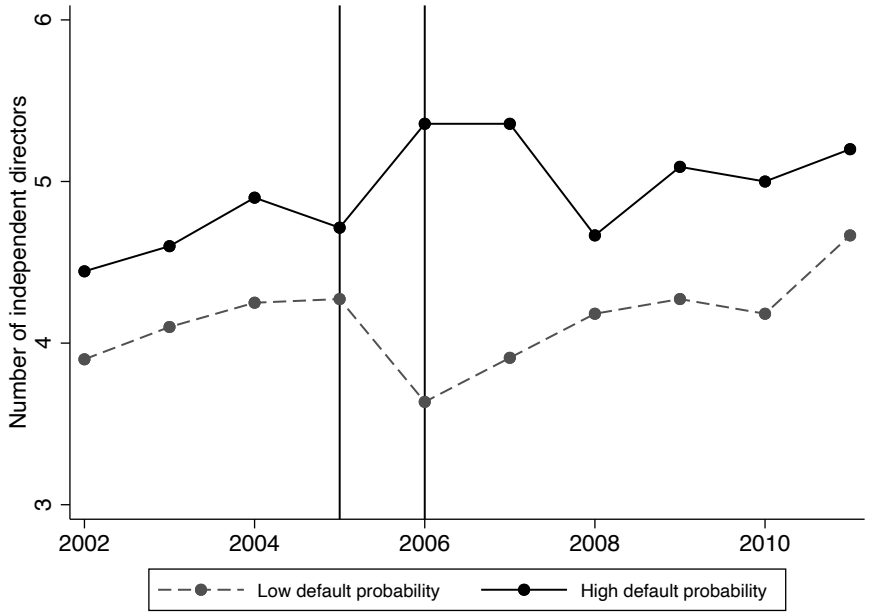



**Figure 1**
Bankruptcy reform in Germany and the number of independent directors

Panel A plots the average number of independent directors for high and low default probability firms. Panel B plots the point estimates (black dots) and the 95% confidence intervals (grey bars) on the interaction terms between a set of time dummies and a dummy indicating firms with high default probability. The point estimates are relative to the year prior to the reform, 2011. The dependent variable is the number of independent directors. The regression is specified as in column 2 of Table 4, that is, with firm fixed effects, year fixed effects, controls, and standard errors clustered on the firm level. Detailed point estimates and *t*-values can be found in Table A.5 in the Appendix.

Panel A. Number of independent directors




Panel B. did estimate relative to 2005

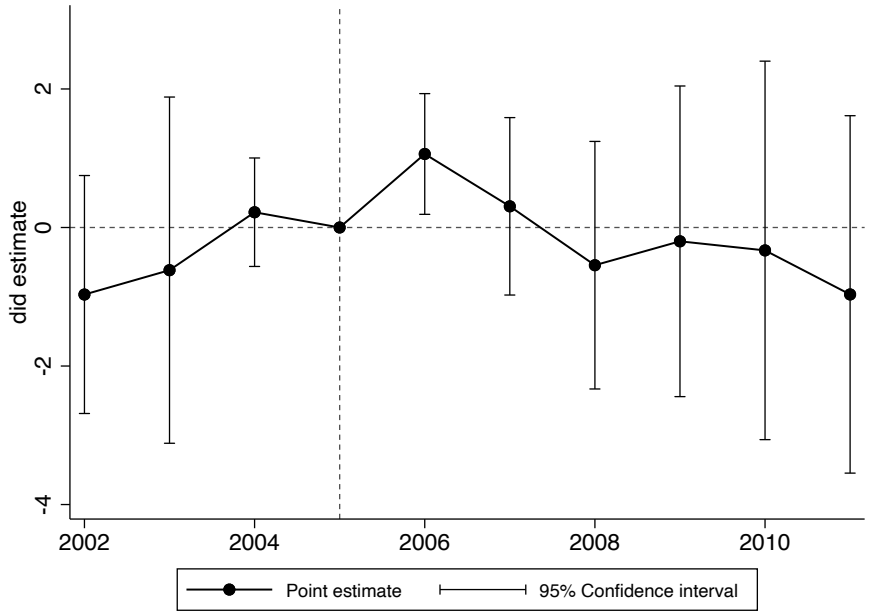



**Figure 2**
Bankruptcy reforms in Italy and the number of independent directors

Panel A plots the average number of independent directors for high and low default probability firms. Panel B plots the point estimates (black dots) and the 95% confidence intervals (grey bars) on the interaction terms between a set of time dummies and a dummy indicating firms with high default probability. The point estimates are relative to the year prior to the reforms, 2005. The dependent variable is the number of independent directors. The regression is specified as in column 2 of Table 5, that is, with firm fixed effects, year fixed effects, controls, and standard errors clustered on the firm level. Detailed point estimates and *t*-values can be found in Table A.7 in the Appendix.

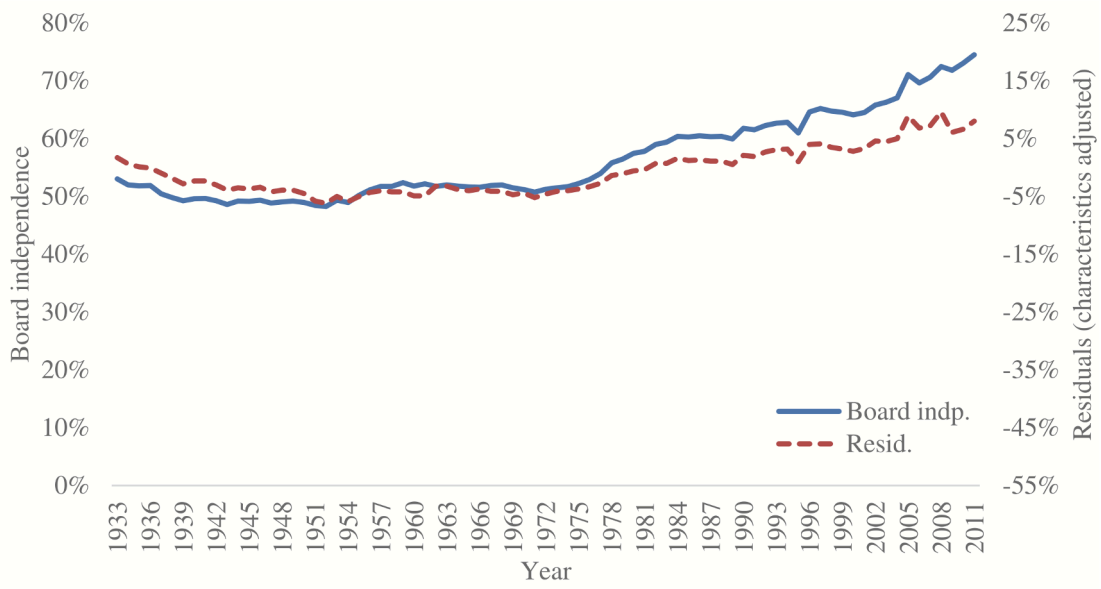



**Figure 3**
US bankruptcy reform and the ratio of the number of independent directors to board size

This figure is a copy of Panel C of Figure 1 from Graham, Kim, and Leary (2020). The solid blue line shows annual means of the ratio of the number of independent directors to the number of directors. The dashed red line shows average regression residuals after controlling for several firm characteristics, including firm age, board size, book assets, Tobin's Q, industry-adjusted return on assets, and asset tangibility. Based on hand-collected data from Moody's Industrial Manuals, from 1920 to 2011, the database of the authors contains about 87,000 firm-year observations of NYSE/AMEX firms.

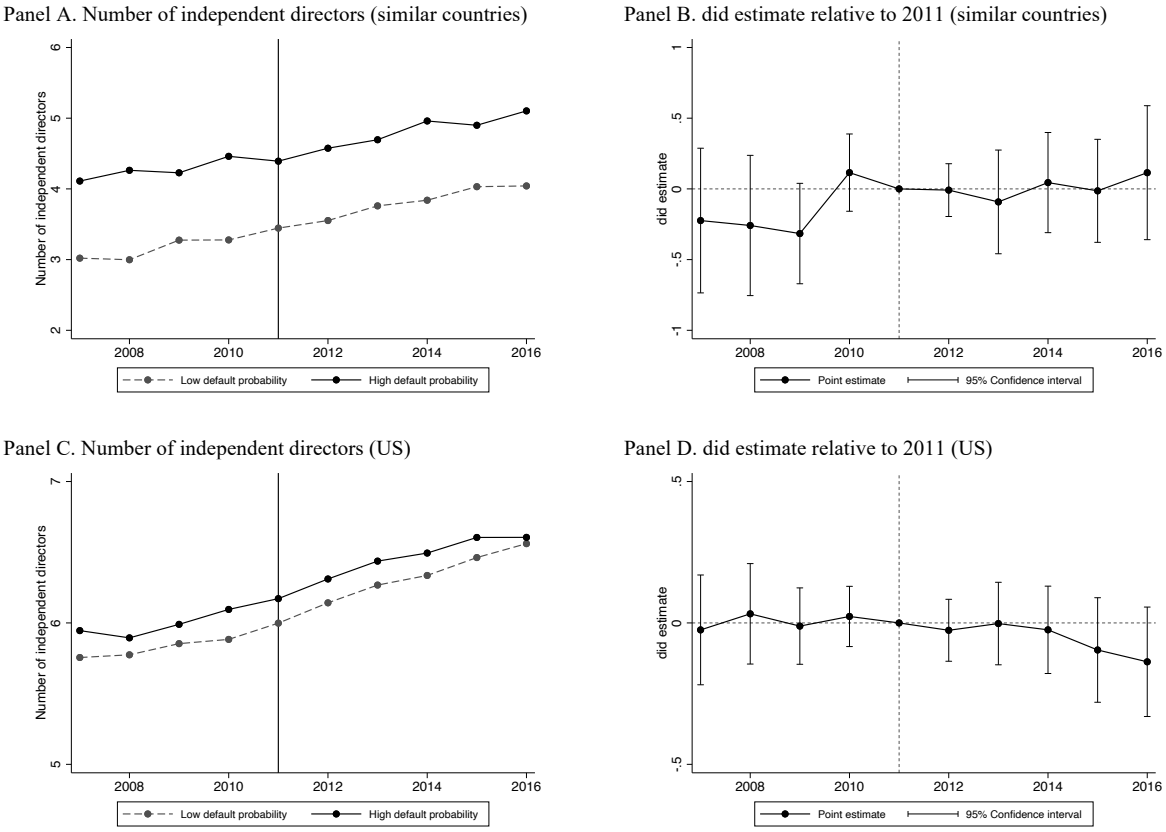



**Figure 4**

Bankruptcy reform in Germany and the number of independent directors of firms in other countries

Panels A (similar countries) and C (US) plot the average number of independent directors for high and low default probability firms. Panels B (similar countries) and D (US) plot the point estimates (black dots) and the 95% confidence intervals (grey bars) on the interaction terms between a set of time dummies and a dummy indicating firms with high default probability. The point estimates are relative to the year prior to the reform, 2011. The dependent variable is the number of independent directors. The regression is specified as in column 1 of Table 6, that is, with firm fixed effects, year fixed effects, controls, and standard errors clustered on the firm level. Detailed point estimates and *t*-values can be found in Table A.5 in the Appendix.

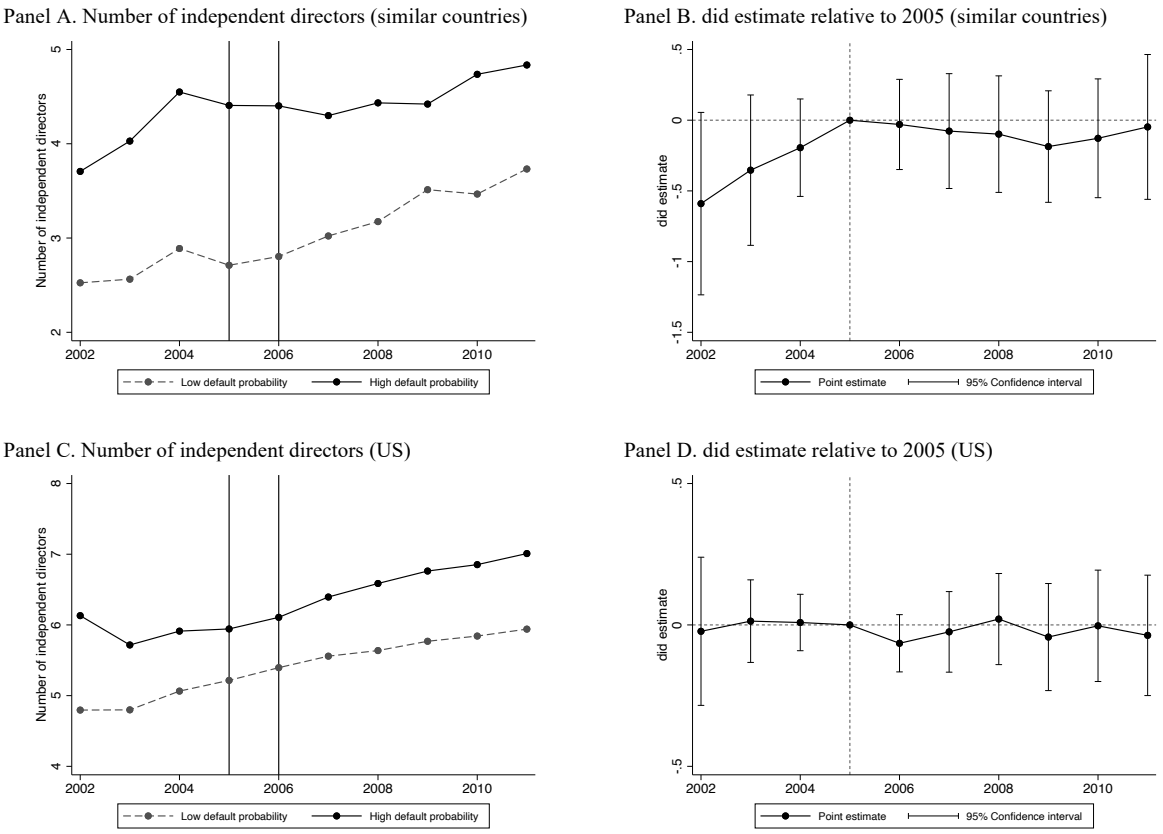



**Figure 5**

Bankruptcy reforms in Italy and the number of independent directors of firms in other countries

Panels A (similar countries) and C (US) plot the average number of independent directors for high and low default probability firms. Panels B (similar countries) and D (US) plot the point estimates (black dots) and the 95% confidence intervals (grey bars) on the interaction terms between a set of time dummies and a dummy indicating firms with high default probability. The point estimates are relative to the year prior to the reforms, 2005. The dependent variable is the number of independent directors. The regression is specified as in column 1 of Table 6, that is, with firm fixed effects, year fixed effects, controls, and standard errors clustered on the firm level. Detailed point estimates and *t*-values can be found in Table A.7 in the Appendix.

# Appendix

**Table A.1**
Variable definitions

| Variable name | Variable definition | Source |
|---|---|---|
| *Board characteristics* | | |
| log(Number of independent directors) | Logarithm of the number of independent board members. | BoardEx |
| Ratio of the number of independents to board size | Ratio of the number of independent board members to the number of board members. | BoardEx |
| log(Board size) | Logarithm of the number of board members. | BoardEx |
| *Country characteristics* | | |
| Creditor rights (CRIGHTS) | Aggregate index of creditor rights, following La Porta et al. (1998). The index is the sum of the four individual components described below. The index ranges from zero to four and higher values indicate stricter bankruptcy penalties on management in default. The data are from 2003 and come from Djankov, McLiesh, and Shleifer (2007), who updated and enlarged the data of La Porta et al. (1998). | Djankov, McLiesh, and Shleifer (2007) |
| No automatic stay (AUTOSTAY) | Equals one if secured creditors are able to seize their collateral after the reorganization procedure is approved, that is, if there is no automatic stay on the assets of the firm. Equals zero if the law imposes automatic stay on the assets, thereby protecting the debtor against secured creditors. | Djankov, McLiesh, and Shleifer (2007) |
| Reorganization (REORG) | Equals one if the reorganization procedure imposes restrictions, such as secured creditors' consent or minimum dividends, for a debtor to file for reorganization. Equals zero if management can seek protection from creditors unilaterally by filing for reorganization. | Djankov, McLiesh, and Shleifer (2007) |
| Secured creditors first (SECURED) | Equals one if secured creditors are ranked first in the distribution of the proceeds that result from the disposition of the assets of a bankrupt firm. Equals zero if other claimants, such as the government or workers, are given absolute priority. | Djankov, McLiesh, and Shleifer (2007) |
| No management stay (MANAGES) | Equals one if an administrator is automatically appointed for running the business during the reorganization procedure, that is, management is dismissed in the reorganization procedure. Equals zero if management retains corporate control during reorganization. | Djankov, McLiesh, and Shleifer (2007) |
| Revised shareholder rights (SHRIGHTS) | Aggregate index of shareholder rights, following La Porta et al. (1998). The index is formed by adding one when: (1) shareholders are allowed to mail their proxy vote to the firm, (2) shareholders are not required to deposit their shares prior to the general shareholders' meeting, (3) cumulative voting or proportional representation of minorities (shareholders owning 10% or less of the capital) in the board of directors is allowed, (4) an oppressed minorities mechanism is in place, (5) the minimum percentage of share capital that entitles a single shareholder to call for an extraordinary shareholders' meeting is less than or equal to 10%, and (6) shareholders have preemptive rights. The index ranges from zero to six and higher values indicate better legal protection of minority shareholders. The data are from 2003 and come from Djankov et al. (2008), who revised, updated, and enlarged the data of La Porta et al. (1998). | Djankov et al. (2008) |
| Legal origin | Dummy variables that identify the legal origin of the company law or commercial code of each country. The five origins are English, French, German, Nordic, and Socialist. | Djankov, McLiesh, and Shleifer (2007) |
| Rule of law | "captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence." The index ranges from -2.5 (weak) to 2.5 (strong). Details on the data sources, the aggregation method, and the precise interpretation of the index can be found in Kaufmann, Kraay, and Mastruzzi (2010). | Quotation and source are from World Bank (Worldwide Governance Indicators) |
| GDP per capita | Logarithm of the real GDP per capita. The data are in constant 2010 US dollars. | World Bank |
| Market cap | Logarithm of the average stock market capitalization in US dollars. | World Bank |
| *Firm characteristics* | | |
| Altman's Z-score | Sum of 1.2 times net working capital divided by total assets, 1.4 times retained earnings divided by total assets, 3.3 times EBIT divided by total assets, 0.6 times market value of equity divided by total liabilities, and 0.99 times sales divided by total assets. Firms with low Z-score have high default probability and firms with high Z-score have low default probability. | Worldscope |
| Size | Logarithm of total assets in millions of US dollars. | Worldscope |
| Leverage | Ratio of total debt to total assets. | Worldscope |
| Return on assets | Ratio of EBITDA to total assets. | Worldscope |
| Return volatility | Average standard deviation of return on assets. | Worldscope |
| Market-to-book | Ratio of total assets plus market value of equity minus book value of equity to total assets. | Worldscope |
| Insider ownership | Ratio of the number of closely held shares by insiders (shareholders who hold at least 5% of the outstanding shares, such as officers and directors and immediate families, other corporations, or individuals) to the number of shares outstanding. | Worldscope |
| Free cash flow | Ratio of EBITDA minus capital expenditures to total assets. | Worldscope |

*Appendix*

| | | |
|---|---|---|
| Interest coverage ratio | Ratio of EBIT to interest expenses. | Worldscope |
| Board rules | Dummy variables that identify whether a country requires or encourages a certain level of board independence. The three board rules are rule-based, comply-or-explain, and no rule. | Fauver et al. (2017) |
| Board structures | Dummy variables that identify the board structure of each country. The three board structures are one-tier, two-tier, and mixed (choice over board structure). | Adams and Ferreira (2007) and Ferreira and Kirchmaier (2013) |
| Accounting standards | Index of accounting standards, created by the Center for International Financial Analysis and Research (CIFAR, 1995). The index is constructed by examining and rating companies' annual reports for their inclusion or omission of 85 items. The index ranges from zero to 100 and higher values indicate better accounting standards. The data come from Bhattacharya, Daouk, and Welker (2003) and Hope, Kang, and Zang (2007). | Bhattacharya, Daouk, and Welker (2003) and Hope, Kang, and Zang (2007) |
| Institutional ownership | Average institutional ownership in a country in 2010. The data are from Dyck et al. (2019). Because Dyck et al. (2019) do not report results for the US, the data for the US are from Aggarwal et al. (2011) and are from 2007. | Dyck et al. (2019) and Aggarwal et al. (2011) |

**Table A.2**

Board independence and bankruptcy penalties (additional controls)

This table presents estimates of OLS regressions. The dependent variable is the logarithm of the number of independent directors (plus one) in Panel A, the ratio of the number of independent directors to board size in Panel B, and the logarithm of board size in Panel C. Columns 1 to 7 show the results for the full sample. Columns 8 to 10 show the results when US and UK firms are excluded. For columns 6 and 9, Risk is a dummy variable that equals one if a firm has a default probability that is above the median bankruptcy probability distribution of its country for a given year (low Altman's Z-score), and zero if a firm has a default probability that is below the median bankruptcy probability distribution (high Altman's Z-score). For columns 7 and 10, Risk is a dummy variable that equals one if a firm has a default probability that is in the highest quartile of the bankruptcy probability distribution, and zero if a firm has a default probability that is in the lowest quartile of the bankruptcy probability distribution (cutting off the middle 50% of the distribution). *t*-values are reported in parentheses and are based on standard errors clustered at the country level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Refer to Table A.1 in the Appendix for variable definitions.

Panel A. Dependent variable: logarithm of the number of independent directors

| | All countries | | | | | | | Exclude US & UK | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| CR x Risk | | | | | | -0.023*** | -0.046*** | | -0.032** | -0.057*** |
| | | | | | | (-5.12) | (-7.25) | | (-2.49) | (-3.29) |
| CR | -0.119*** | -0.124*** | -0.084*** | -0.091*** | -0.143*** | -0.132*** | -0.135*** | -0.168** | -0.152** | -0.142* |
| | (-3.25) | (-6.34) | (-3.77) | (-4.45) | (-4.36) | (-4.04) | (-4.02) | (-2.76) | (-2.45) | (-2.03) |
| Comply-exp. | 0.228 | | | | -0.217 | -0.216 | -0.196 | -0.287 | -0.286 | -0.278 |
| | (1.44) | | | | (-1.10) | (-1.10) | (-0.94) | (-1.25) | (-1.26) | (-1.14) |
| Rule-based | 0.203 | | | | 0.004 | 0.006 | -0.010 | -0.003 | -0.003 | -0.007 |
| | (1.56) | | | | (0.02) | (0.03) | (-0.05) | (-0.02) | (-0.02) | (-0.03) |
| Mixed | | -0.038 | | | -0.278* | -0.278* | -0.323* | -0.362* | -0.362* | -0.419* |
| | | (-0.39) | | | (-1.91) | (-1.92) | (-2.03) | (-1.87) | (-1.87) | (-1.95) |
| Two-tier | | 0.264** | | | 0.413*** | 0.412*** | 0.362*** | 0.429** | 0.429** | 0.359* |
| | | (2.44) | | | (3.86) | (3.85) | (3.41) | (2.59) | (2.60) | (2.06) |
| Inst. owner | | | -0.000 | | -0.001 | -0.001 | -0.000 | -0.004 | -0.004 | -0.003 |
| | | | (-0.02) | | (-0.46) | (-0.46) | (-0.04) | (-1.19) | (-1.20) | (-0.72) |
| Accounting | | | | -0.003 | 0.022*** | 0.022*** | 0.021*** | 0.027*** | 0.027*** | 0.027*** |
| | | | | (-0.62) | (3.52) | (3.51) | (3.15) | (3.71) | (3.71) | (3.66) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fe | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fe | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 84,584 | 83,476 | 86,613 | 84,815 | 79,909 | 79,907 | 39,935 | 28,440 | 28,438 | 14,202 |
| No. countries | 41 | 37 | 40 | 37 | 27 | 27 | 27 | 25 | 25 | 25 |
| $R^2$ | 0.546 | 0.552 | 0.538 | 0.544 | 0.567 | 0.568 | 0.556 | 0.435 | 0.436 | 0.411 |

*(continued)*

**Table A.2** *(continued)*

Panel B. Dependent variable: ratio of the number of independent directors to board size

| | All countries | | | | | | | Exclude US & UK | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| CR x Risk | | | | | | -0.005*** | -0.012*** | | -0.008 | -0.017*** |
| | | | | | | (-3.44) | (-6.27) | | (-1.37) | (-2.96) |
| CR | -0.064*** | -0.054*** | -0.046*** | -0.046*** | -0.071*** | -0.068*** | -0.068*** | -0.016 | -0.012 | -0.010 |
| | (-3.84) | (-5.74) | (-4.20) | (-4.33) | (-3.77) | (-3.60) | (-3.51) | (-0.61) | (-0.44) | (-0.35) |
| Comply-exp. | 0.085 | | | | -0.030 | -0.029 | -0.033 | -0.055 | -0.054 | -0.065 |
| | (1.32) | | | | (-0.24) | (-0.23) | (-0.27) | (-0.43) | (-0.42) | (-0.49) |
| Rule-based | 0.060 | | | | 0.007 | 0.008 | 0.001 | 0.029 | 0.030 | 0.024 |
| | (1.06) | | | | (0.06) | (0.07) | (0.01) | (0.28) | (0.29) | (0.23) |
| Mixed | | -0.015 | | | -0.070 | -0.070 | -0.095 | -0.043 | -0.043 | -0.074 |
| | | (-0.23) | | | (-0.71) | (-0.71) | (-0.94) | (-0.40) | (-0.40) | (-0.65) |
| Two-tier | | 0.076 | | | 0.124* | 0.123* | 0.112 | 0.062 | 0.061 | 0.048 |
| | | (1.54) | | | (1.74) | (1.72) | (1.54) | (0.75) | (0.74) | (0.57) |
| Inst. owner | | | -0.001 | | -0.001 | -0.001 | -0.000 | 0.001 | 0.001 | 0.002 |
| | | | (-0.74) | | (-0.73) | (-0.73) | (-0.24) | (0.64) | (0.64) | (1.01) |
| Accounting | | | | -0.001 | 0.005 | 0.005 | 0.005 | 0.008* | 0.008* | 0.008* |
| | | | | (-0.27) | (1.17) | (1.16) | (1.11) | (1.82) | (1.81) | (1.90) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fe | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fe | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 84,584 | 83,476 | 86,613 | 84,815 | 79,909 | 79,907 | 39,935 | 28,440 | 28,438 | 14,202 |
| No. countries | 41 | 37 | 40 | 37 | 27 | 27 | 27 | 25 | 25 | 25 |
| $R^2$ | 0.584 | 0.583 | 0.578 | 0.577 | 0.590 | 0.591 | 0.573 | 0.467 | 0.468 | 0.429 |

Panel C. Dependent variable: logarithm of board size

| | All countries | | | | | | | Exclude US & UK | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| CR x Risk | | | | | | -0.014** | -0.028*** | | -0.006 | -0.014 |
| | | | | | | (-2.73) | (-4.19) | | (-0.47) | (-0.80) |
| CR | -0.057** | -0.066*** | -0.009 | -0.009 | -0.052* | -0.045 | -0.042 | -0.166*** | -0.163*** | -0.147** |
| | (-2.35) | (-4.04) | (-0.42) | (-0.49) | (-1.98) | (-1.68) | (-1.57) | (-2.99) | (-2.89) | (-2.50) |
| Comply-exp. | 0.284*** | | | | 0.158 | 0.157 | 0.179 | 0.232* | 0.231* | 0.244 |
| | (3.02) | | | | (1.00) | (1.00) | (1.17) | (1.74) | (1.73) | (1.71) |
| Rule-based | 0.325*** | | | | 0.178 | 0.177 | 0.191 | 0.132 | 0.131 | 0.153 |
| | (3.18) | | | | (1.03) | (1.03) | (1.19) | (1.05) | (1.04) | (1.23) |
| Mixed | | -0.065 | | | 0.001 | 0.001 | -0.004 | -0.029 | -0.029 | -0.039 |
| | | (-0.72) | | | (0.01) | (0.01) | (-0.04) | (-0.28) | (-0.28) | (-0.38) |
| Two-tier | | 0.224** | | | 0.164** | 0.165** | 0.136 | 0.308** | 0.310** | 0.253** |
| | | (2.44) | | | (2.09) | (2.10) | (1.61) | (2.77) | (2.79) | (2.20) |
| Inst. owner | | | 0.005** | | 0.002 | 0.002 | 0.002 | -0.003 | -0.003 | -0.002 |
| | | | (2.39) | | (0.88) | (0.88) | (0.95) | (-0.66) | (-0.66) | (-0.41) |
| Accounting | | | | -0.007 | 0.002 | 0.002 | 0.003 | -0.004 | -0.004 | -0.002 |
| | | | | (-1.24) | (0.29) | (0.30) | (0.42) | (-0.66) | (-0.66) | (-0.34) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fe | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fe | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 84,584 | 83,476 | 86,613 | 84,815 | 79,909 | 79,907 | 39,935 | 28,440 | 28,438 | 14,202 |
| No. countries | 41 | 37 | 40 | 37 | 27 | 27 | 27 | 25 | 25 | 25 |
| $R^2$ | 0.490 | 0.493 | 0.476 | 0.476 | 0.509 | 0.509 | 0.506 | 0.523 | 0.523 | 0.531 |

**Table A.3**

Board independence and bankruptcy penalties: difference in default probability (interest coverage ratio)

This table presents estimates of OLS regressions. The dependent variable is the logarithm of the number of independent directors (plus one) in Panel A, the ratio of the number of independent directors to board size in Panel B, and the logarithm of board size in Panel C. Columns 1 to 7 show the results for the full sample. Columns 8 and 9 show the results when US and UK firms are excluded. For columns 1 and 8, HighRisk is a dummy variable that equals one if a firm has a default probability that is above the median bankruptcy probability distribution of its country for a given year (low interest coverage ratio), and zero if a firm has a default probability that is below the median bankruptcy probability distribution (high interest coverage ratio). For column 2, HighRisk is a dummy variable that equals one if a firm has a default probability that is in the highest tercile of the bankruptcy probability distribution, and zero if a firm has a default probability that is in the lowest tercile of the bankruptcy probability distribution (cutting off the middle 33% of the distribution). For columns 3–7 and 9, HighRisk is a dummy variable that equals one if a firm has a default probability that is in the highest quartile of the bankruptcy probability distribution, and zero if a firm has a default probability that is in the lowest quartile of the bankruptcy probability distribution (cutting off the middle 50% of the distribution). *t*-values are reported in parentheses and are based on standard errors clustered at the country level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. Refer to Table A.1 in the Appendix for variable definitions.

Panel A. Dependent variable: logarithm of the number of independent directors

| | All countries | | | | | | | Exclude US & UK | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| CRIGHTS x HighRisk | -0.025*** | -0.035*** | -0.039*** | | | | | -0.029*** | -0.037*** |
| | (-8.20) | (-9.96) | (-9.36) | | | | | (-5.72) | (-4.28) |
| CRIGHTS | -0.072*** | -0.071*** | -0.070*** | | | | | -0.038 | -0.021 |
| | (-3.42) | (-2.99) | (-2.73) | | | | | (-1.42) | (-0.69) |
| AUTOSTAY x HighRisk | | | | -0.075*** | | | | | |
| | | | | (-3.39) | | | | | |
| AUTOSTAY | | | | -0.139** | | | | | |
| | | | | (-2.25) | | | | | |
| REORG x HighRisk | | | | | -0.090*** | | | | |
| | | | | | (-4.80) | | | | |
| REORG | | | | | -0.143** | | | | |
| | | | | | (-2.24) | | | | |
| SECURED x HighRisk | | | | | | -0.065** | | | |
| | | | | | | (-2.03) | | | |
| SECURED | | | | | | -0.014 | | | |
| | | | | | | (-0.11) | | | |
| MANAGES x HighRisk | | | | | | | -0.084*** | | |
| | | | | | | | (-4.13) | | |
| MANAGES | | | | | | | -0.129** | | |
| | | | | | | | (-2.08) | | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 86,867 | 57,840 | 43,326 | 43,326 | 43,326 | 43,326 | 43,326 | 35,398 | 17,593 |
| Number of countries | 49 | 45 | 44 | 44 | 44 | 44 | 44 | 47 | 42 |
| $R^2$ | 0.536 | 0.515 | 0.507 | 0.503 | 0.503 | 0.493 | 0.502 | 0.379 | 0.348 |

*(continued)*

**Table A.3** *(continued)*

Panel B. Dependent variable: ratio of the number of independent directors to board size

| | All countries | | | | | | | Exclude US & UK | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| CRIGHTS x HighRisk | -0.007*** | -0.009*** | -0.010*** | | | | | -0.009*** | -0.011** |
| | (-5.94) | (-6.89) | (-5.25) | | | | | (-3.72) | (-2.32) |
| CRIGHTS | -0.041*** | -0.043*** | -0.043*** | | | | | -0.026* | -0.022 |
| | (-4.30) | (-3.98) | (-3.74) | | | | | (-1.85) | (-1.42) |
| AUTOSTAY x HighRisk | | | | -0.013 | | | | | |
| | | | | (-1.62) | | | | | |
| AUTOSTAY | | | | -0.107*** | | | | | |
| | | | | (-5.22) | | | | | |
| REORG x HighRisk | | | | | -0.023*** | | | | |
| | | | | | (-4.04) | | | | |
| REORG | | | | | -0.065** | | | | |
| | | | | | (-2.18) | | | | |
| SECURED x HighRisk | | | | | | -0.024* | | | |
| | | | | | | (-1.72) | | | |
| SECURED | | | | | | 0.005 | | | |
| | | | | | | (0.09) | | | |
| MANAGES x HighRisk | | | | | | | -0.023*** | | |
| | | | | | | | (-3.67) | | |
| MANAGES | | | | | | | -0.089*** | | |
| | | | | | | | (-3.22) | | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 86,867 | 57,840 | 43,326 | 43,326 | 43,326 | 43,326 | 43,326 | 35,398 | 17,593 |
| Number of countries | 49 | 45 | 44 | 44 | 44 | 44 | 44 | 47 | 42 |
| $R^2$ | 0.576 | 0.560 | 0.557 | 0.557 | 0.546 | 0.538 | 0.551 | 0.423 | 0.387 |

Panel C. Dependent variable: logarithm of board size

| | All countries | | | | | | | Exclude US & UK | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| CRIGHTS x HighRisk | -0.010*** | -0.015*** | -0.019*** | | | | | -0.007 | -0.011** |
| | (-5.04) | (-6.41) | (-7.08) | | | | | (-1.30) | (-2.32) |
| CRIGHTS | -0.022 | -0.015 | -0.011 | | | | | 0.005 | 0.013 |
| | (-1.25) | (-0.89) | (-0.67) | | | | | (0.17) | (0.45) |
| AUTOSTAY x HighRisk | | | | -0.059*** | | | | | |
| | | | | (-7.53) | | | | | |
| AUTOSTAY | | | | -0.009 | | | | | |
| | | | | (-0.21) | | | | | |
| REORG x HighRisk | | | | | -0.046*** | | | | |
| | | | | | (-4.10) | | | | |
| REORG | | | | | -0.049 | | | | |
| | | | | | (-0.85) | | | | |
| SECURED x HighRisk | | | | | | -0.000 | | | |
| | | | | | | (-0.00) | | | |
| SECURED | | | | | | -0.062 | | | |
| | | | | | | (-1.14) | | | |
| MANAGES x HighRisk | | | | | | | -0.033** | | |
| | | | | | | | (-2.28) | | |
| MANAGES | | | | | | | 0.013 | | |
| | | | | | | | (0.23) | | |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 86,867 | 57,840 | 43,326 | 43,326 | 43,326 | 43,326 | 43,326 | 35,398 | 17,593 |
| Number of countries | 49 | 45 | 44 | 44 | 44 | 44 | 44 | 47 | 42 |
| $R^2$ | 0.467 | 0.447 | 0.430 | 0.430 | 0.432 | 0.428 | 0.428 | 0.432 | 0.429 |

**Table A.4**

Summary statistics for the bankruptcy reform in Germany

This table presents summary statistics regarding the bankruptcy reform in Germany, separately for firms with high default probability (columns 1–3) and firms with low default probability (columns 4–6). The columns show: columns 1 and 4, average for all years (2007 to 2016); columns 2 and 5, average for the years before the reform (2007 to 2011); and columns 3 and 6, average for the years after the reform (2012 to 2016). Columns 7, 8, and 9 present *p*-values of *t*-tests of difference in means between high and low default probability firms for all years, for the years before the reform, and for the years after the reform, respectively. Refer to Table A.1 in the Appendix for variable definitions.

| | High default probability | | | Low default probability | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | All | Before | After | All | Before | After | *p*-all | *p*-before | *p*-after |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Number of independents | 1.81 | 1.20 | 2.30 | 1.60 | 1.63 | 1.57 | 0.28 | 0.08 | 0.01 |
| Ratio independents to board size | 0.133 | 0.078 | 0.179 | 0.146 | 0.143 | 0.148 | 0.40 | 0.00 | 0.15 |
| Board size | 13.75 | 15.25 | 12.53 | 10.30 | 11.01 | 9.79 | 0.00 | 0.00 | 0.00 |
| Size | 14.29 | 14.89 | 13.81 | 13.12 | 13.32 | 12.97 | 0.00 | 0.00 | 0.00 |
| Leverage | 0.326 | 0.340 | 0.315 | 0.089 | 0.093 | 0.087 | 0.00 | 0.00 | 0.00 |
| Return on assets | 0.032 | 0.010 | 0.049 | 0.148 | 0.175 | 0.129 | 0.00 | 0.00 | 0.00 |
| Market-to-book | 1.67 | 1.34 | 1.94 | 2.36 | 2.27 | 2.42 | 0.00 | 0.00 | 0.00 |
| Free cash flow | -0.013 | -0.040 | 0.009 | 0.112 | 0.138 | 0.093 | 0.00 | 0.00 | 0.00 |
| Insider ownership | 0.347 | 0.353 | 0.342 | 0.452 | 0.468 | 0.440 | 0.00 | 0.00 | 0.00 |
| Altman's Z-score | 0.55 | 0.50 | 0.59 | 6.79 | 6.71 | 6.85 | 0.00 | 0.00 | 0.00 |

**Table A.5**

Detailed point estimates and *t*-values for figures on Germany's bankruptcy reform

This table reports the point estimates and *t*-values regarding Figures 1, A.1, and 4. *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.

| | Figure 1 (Panel B) | Figure A.1 (Panel B) | Figure A.1 (Panel D) | Figure 4 (Panel B) | Figure 4 (Panel D) |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| 2002 x HighRisk | -0.302 | 0.026 | 1.978 | - | - |
| | (-0.33) | (0.50) | (1.58) | - | - |
| Number of observations | 132 | 132 | 132 | - | - |
| Number of firms | 104 | 104 | 104 | - | - |
| $R^2$ (within) | 0.477 | 0.504 | 0.398 | - | - |
| 2003 x HighRisk | -0.411 | 0.019 | 1.278 | - | - |
| | (-0.46) | (0.34) | (1.56) | - | - |
| Number of observations | 132 | 132 | 132 | - | - |
| Number of firms | 104 | 104 | 104 | - | - |
| $R^2$ (within) | 0.506 | 0.517 | 0.388 | - | - |
| 2004 x HighRisk | -0.396 | 0.003 | 2.095** | - | - |
| | (-0.59) | (0.08) | (2.20) | - | - |
| Number of observations | 133 | 133 | 133 | - | - |
| Number of firms | 105 | 105 | 105 | - | - |
| $R^2$ (within) | 0.567 | 0.588 | 0.378 | - | - |
| 2005 x HighRisk | -0.264 | -0.003 | 1.112 | - | - |
| | (-0.45) | (-0.09) | (1.24) | - | - |
| Number of observations | 151 | 151 | 151 | - | - |
| Number of firms | 108 | 108 | 108 | - | - |
| $R^2$ (within) | 0.404 | 0.412 | 0.193 | - | - |
| 2006 x HighRisk | -0.341 | 0.002 | 1.047 | - | - |
| | (-0.65) | (0.07) | (1.15) | - | - |
| Number of observations | 153 | 153 | 153 | - | - |
| Number of firms | 108 | 108 | 108 | - | - |
| $R^2$ (within) | 0.410 | 0.432 | 0.247 | - | - |
| 2007 x HighRisk | -0.611 | -0.023 | 0.963 | -0.224 | -0.025 |
| | (-1.09) | (-0.79) | (1.40) | (-0.86) | (-0.25) |
| Number of observations | 157 | 157 | 157 | 408 | 2,527 |
| Number of firms | 110 | 110 | 110 | 243 | 1,521 |
| $R^2$ (within) | 0.362 | 0.402 | 0.282 | 0.146 | 0.076 |
| 2008 x HighRisk | -0.248 | 0.010 | -0.673 | -0.259 | 0.032 |
| | (-0.84) | (0.54) | (-1.23) | (-1.03) | (0.36) |
| Number of observations | 162 | 162 | 162 | 420 | 2,592 |
| Number of firms | 110 | 110 | 110 | 246 | 1,541 |
| $R^2$ (within) | 0.364 | 0.357 | 0.233 | 0.138 | 0.071 |
| 2009 x HighRisk | 0.025 | 0.014 | 0.182 | -0.316* | -0.011 |
| | (0.09) | (1.08) | (0.22) | (-1.75) | (-0.16) |
| Number of observations | 156 | 156 | 156 | 402 | 2,496 |
| Number of firms | 104 | 104 | 104 | 224 | 1,436 |
| $R^2$ (within) | 0.316 | 0.336 | 0.142 | 0.120 | 0.041 |
| 2010 x HighRisk | 0.167 | 0.013 | -0.083 | 0.115 | 0.023 |
| | (0.66) | (0.85) | (-0.27) | (0.83) | (0.42) |
| Number of observations | 161 | 161 | 161 | 402 | 2,491 |
| Number of firms | 102 | 102 | 102 | 218 | 1,331 |
| $R^2$ (within) | 0.142 | 0.138 | 0.081 | 0.060 | 0.036 |
| 2012 x HighRisk | 0.501** | 0.056* | -0.296 | -0.009 | -0.026 |
| | (2.35) | (1.74) | (-1.06) | (-0.09) | (-0.47) |
| Number of observations | 195 | 195 | 195 | 414 | 2,345 |
| Number of firms | 100 | 100 | 100 | 219 | 1,246 |
| $R^2$ (within) | 0.189 | 0.188 | 0.038 | 0.068 | 0.044 |
| 2013 x HighRisk | 0.674*** | 0.056** | -0.208 | -0.092 | -0.002 |
| | (2.92) | (2.26) | (-0.59) | (-0.49) | (-0.03) |
| Number of observations | 192 | 192 | 192 | 408 | 2,251 |
| Number of firms | 100 | 100 | 100 | 220 | 1,248 |
| $R^2$ (within) | 0.189 | 0.150 | 0.103 | 0.089 | 0.067 |
| 2014 x HighRisk | 1.007*** | 0.087*** | -0.319 | 0.045 | -0.024 |
| | (3.44) | (2.94) | (-0.80) | (0.25) | (-0.31) |
| Number of observations | 187 | 187 | 187 | 405 | 2,212 |
| Number of firms | 100 | 100 | 100 | 220 | 1,247 |
| $R^2$ (within) | 0.254 | 0.216 | 0.146 | 0.109 | 0.094 |
| 2015 x HighRisk | 1.109** | 0.086** | -0.443 | -0.014 | -0.096 |
| | (2.54) | (2.05) | (-0.83) | (-0.07) | (-1.02) |
| Number of observations | 185 | 185 | 185 | 399 | 2,139 |
| Number of firms | 100 | 100 | 100 | 220 | 1,247 |
| $R^2$ (within) | 0.253 | 0.209 | 0.123 | 0.150 | 0.087 |
| 2016 x HighRisk | 1.557** | 0.105** | 0.156 | 0.115 | -0.137 |
| | (2.50) | (2.18) | (0.34) | (0.48) | (-1.39) |
| Number of observations | 183 | 183 | 183 | 395 | 2,055 |
| Number of firms | 100 | 100 | 100 | 218 | 1,244 |
| $R^2$ (within) | 0.256 | 0.249 | 0.107 | 0.158 | 0.094 |
| 2017 x HighRisk | 1.623*** | 0.124** | 0.037 | - | - |
| | (2.71) | (2.43) | (0.07) | - | - |
| Number of observations | 177 | 177 | 177 | - | - |
| Number of firms | 100 | 100 | 100 | - | - |
| $R^2$ (within) | 0.309 | 0.294 | 0.142 | - | - |
| Firm controls | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effects | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes |

**Table A.6**

Summary statistics for the bankruptcy reforms in Italy

This table presents summary statistics regarding the bankruptcy reforms in Italy, separately for firms with high default probability (columns 1–3) and firms with low default probability (columns 4–6). The columns show: columns 1 and 4, average for all years (2002 to 2011); columns 2 and 5, average for the years before the reforms (2002 to 2005); and columns 3 and 6, average for the years after the reforms (2006 to 2011). Columns 7, 8, and 9 present *p*-values of *t*-tests of difference in means between high and low default probability firms for all years, for the years before the reforms, and for the years after the reforms, respectively. Refer to Table A.1 in the Appendix for variable definitions.

| | High default probability | | | Low default probability | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | All | Before | After | All | Before | After | *p*-all | *p*-before | *p*-after |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Number of independents | 4.96 | 4.67 | 5.13 | 4.13 | 4.13 | 4.13 | 0.01 | 0.29 | 0.01 |
| Ratio independents to board size | 0.453 | 0.440 | 0.461 | 0.432 | 0.405 | 0.448 | 0.46 | 0.47 | 0.71 |
| Board size | 11.50 | 10.77 | 11.94 | 10.19 | 10.87 | 9.78 | 0.01 | 0.90 | 0.00 |
| Size | 15.63 | 15.55 | 15.69 | 14.41 | 14.61 | 14.29 | 0.00 | 0.01 | 0.00 |
| Leverage | 0.335 | 0.342 | 0.331 | 0.164 | 0.165 | 0.162 | 0.00 | 0.00 | 0.00 |
| Return on assets | 0.071 | 0.047 | 0.085 | 0.152 | 0.197 | 0.124 | 0.00 | 0.00 | 0.10 |
| Market-to-book | 1.17 | 1.21 | 1.14 | 1.98 | 2.29 | 1.79 | 0.00 | 0.00 | 0.00 |
| Free cash flow | 0.013 | -0.030 | 0.039 | 0.107 | 0.144 | 0.085 | 0.00 | 0.00 | 0.05 |
| Insider ownership | 0.419 | 0.419 | 0.418 | 0.540 | 0.531 | 0.546 | 0.00 | 0.00 | 0.00 |
| Altman's Z-score | 1.07 | 0.90 | 1.17 | 4.55 | 5.59 | 3.91 | 0.00 | 0.00 | 0.00 |

**Table A.7**

Detailed point estimates and *t*-values for figures on the bankruptcy reforms in Italy

This table reports the point estimates and *t*-values regarding Figures 2 and 5. *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.

| | Figure 2 (Panel B) | Figure 5 (Panel B) | Figure 5 (Panel D) |
|---|---|---|---|
| | (1) | (2) | (3) |
| 2002 x HighRisk | -0.968 | -0.590* | -0.023 |
| | (-1.16) | (-1.80) | (-0.17) |
| Number of observations | 44 | 286 | 2,186 |
| Number of firms | 27 | 195 | 1,622 |
| $R^2$ (within) | 0.306 | 0.291 | 0.387 |
| 2003 x HighRisk | -0.616 | -0.353 | 0.013 |
| | (-0.51) | (-1.31) | (0.18) |
| Number of observations | 45 | 313 | 2,872 |
| Number of firms | 27 | 196 | 1,670 |
| $R^2$ (within) | 0.218 | 0.240 | 0.151 |
| 2004 x HighRisk | 0.221 | -0.195 | 0.009 |
| | (0.58) | (-1.11) | (0.17) |
| Number of observations | 43 | 331 | 3,061 |
| Number of firms | 26 | 192 | 1,652 |
| $R^2$ (within) | 0.524 | 0.138 | 0.053 |
| 2006 x HighRisk | 1.062** | -0.030 | -0.065 |
| | (2.51) | (-0.19) | (-1.26) |
| Number of observations | 50 | 377 | 3,008 |
| Number of firms | 25 | 192 | 1,600 |
| $R^2$ (within) | 0.304 | 0.106 | 0.053 |
| 2007 x HighRisk | 0.306 | -0.077 | -0.025 |
| | (0.49) | (-0.37) | (-0.34) |
| Number of observations | 50 | 366 | 2,855 |
| Number of firms | 25 | 191 | 1,603 |
| $R^2$ (within) | 0.450 | 0.072 | 0.082 |
| 2008 x HighRisk | -0.544 | -0.099 | 0.021 |
| | (-0.63) | (-0.47) | (0.25) |
| Number of observations | 48 | 357 | 2,734 |
| Number of firms | 25 | 191 | 1,600 |
| $R^2$ (within) | 0.533 | 0.049 | 0.120 |
| 2009 x HighRisk | -0.199 | -0.187 | -0.043 |
| | (-0.18) | (-0.93) | (-0.44) |
| Number of observations | 47 | 342 | 2,639 |
| Number of firms | 25 | 190 | 1,604 |
| $R^2$ (within) | 0.230 | 0.157 | 0.159 |
| 2010 x HighRisk | -0.331 | -0.128 | -0.003 |
| | (-0.25) | (-0.60) | (-0.03) |
| Number of observations | 46 | 339 | 2,590 |
| Number of firms | 25 | 191 | 1,605 |
| $R^2$ (within) | 0.331 | 0.124 | 0.177 |
| 2011 x HighRisk | -0.966 | -0.048 | -0.037 |
| | (-0.77) | (-0.18) | (-0.34) |
| Number of observations | 44 | 332 | 2,520 |
| Number of firms | 25 | 190 | 1,604 |
| $R^2$ (within) | 0.358 | 0.201 | 0.165 |
| Firm controls | Yes | Yes | Yes |
| Firm fixed effects | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes |

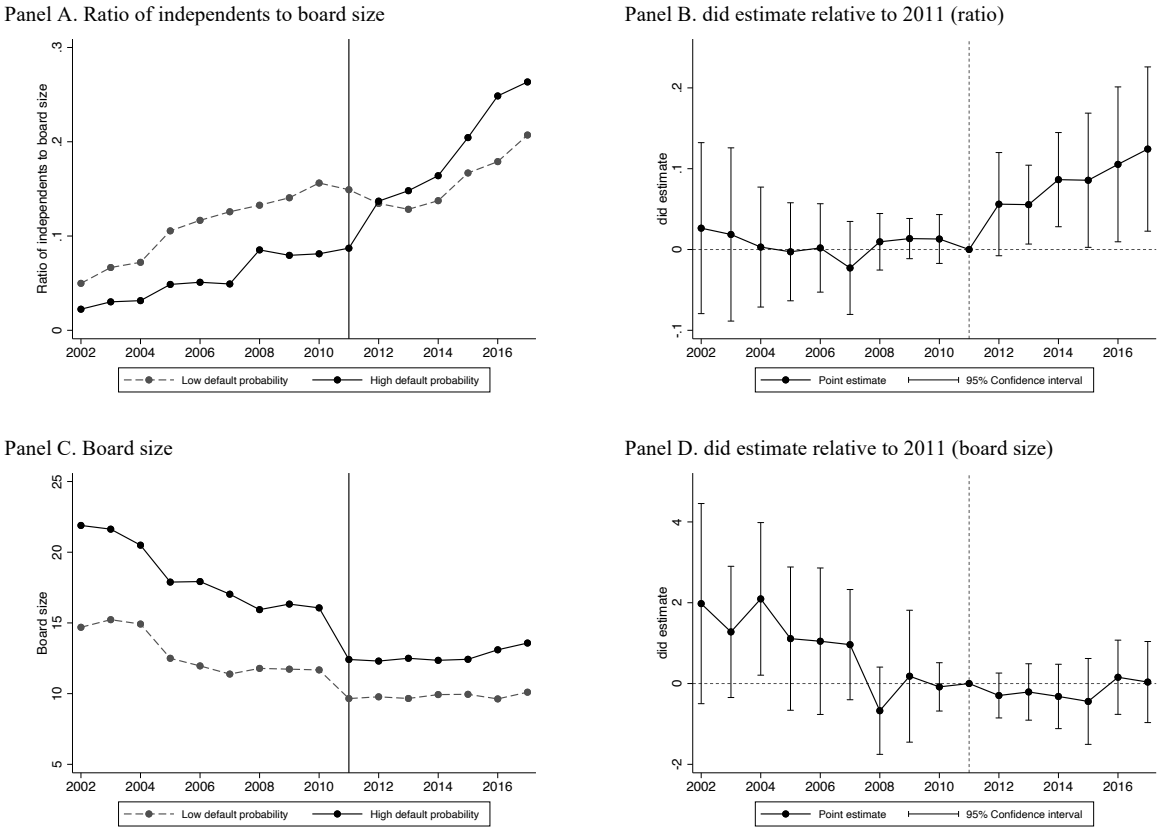



**Figure A.1**
Bankruptcy reform in Germany, the ratio of independents to board size, and the board size

Panels A and C respectively plot the average ratio of independent directors to board size and the average board size for high and low default probability firms. Panels B and D plot the point estimates (black dots) and the 95% confidence intervals (grey bars) on the interaction terms between a set of time dummies and a dummy indicating firms with high default probability. The point estimates are relative to the year prior to the reform, 2011. The dependent variable is the ratio of independent directors to board size in Panel B and the board size in Panel D. The regression is specified as in columns 4 and 6 of Table 4, that is, with firm fixed effects, year fixed effects, controls, and standard errors clustered on the firm level. Detailed point estimates and *t*-values can be found in Table A.5 in the Appendix.